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ABSTRACT

This proceedings document is comprised of the 17 papers, panel presentations, and work shares presented at a 1998 conference on institutional research. The papers are: (1) "Description of the UDAES Project: A Study of Undergraduate Academic Experiences" (Karen W. Bauer); (2) "Transforming Your Campus: Mixed Methodology in Institutional Research" (R.J. Brodnick and Tracy L. Polinsky); (3) "Factors Affecting Grading Practices" (David X. Cheng); (4) "Designing Graduate Admission Studies To Influence Campus Transformation" (Anne Marie Delaney); (5) "Using Microsoft Access to Facilitate the Sampling and Distribution of an Alumni Survey" (Karen DeMonte and Karen W. Bauer); (6) "The Relationship Between Student Success in College and Assessment for Remedial Assistance" (Michael J. Keller and Monica Williams-Randall); (7) "A Formula for Writing Environmental Scans for Community Colleges" (Marcia M. Lee); (8) "Financing Education: An Analysis from the Results of the Survey of Graduates 1989-1997" (Qing Lin Mack and Jennifer A. Brown); (9) "The Impact of Outsourcing Auxiliary Enterprise on Educational Expenditures Per FTE" (Joan B. McDonald and Barbara R. Sadowski); (10) "Math Achievement and Math Course Taking" (Denise Nadasen); (11) "Using Cluster Analysis for Transcript Analysis of Course-Taking Patterns" (Wayne S. Obetz); (12) "From Database to Data Warehouse" (Wayne Obetz and Jane Grosset); (13) "They'll Surf but They Won't Swim: Student Reluctance to Apply to College Online and Implications for Web-Based Survey Research" (Sarah Parrott and Jennifer McKnight); (14) "On-Line News vs. Traditional Media: Student Preference Regarding the Acquisition of Current Events" (Dawn Geronimo Terkla and Jennifer McKnight); (15) "Using Predictive Modeling to Target Student Recruitment: Theory and Practice" (Emily Thomas , Gayle Reznik, and William Dawes); (16) "Comparing Administrative Satisfaction in Public and Private Higher Education" (James Fredericks Volcan and Kelly Parley); and (17) "Factors Affecting Academic Outcomes of Underprepared Community College Students" (Jishen Zhao). Also included are the conference program and the 1998 membership list. (Some papers contain references.) (DB)

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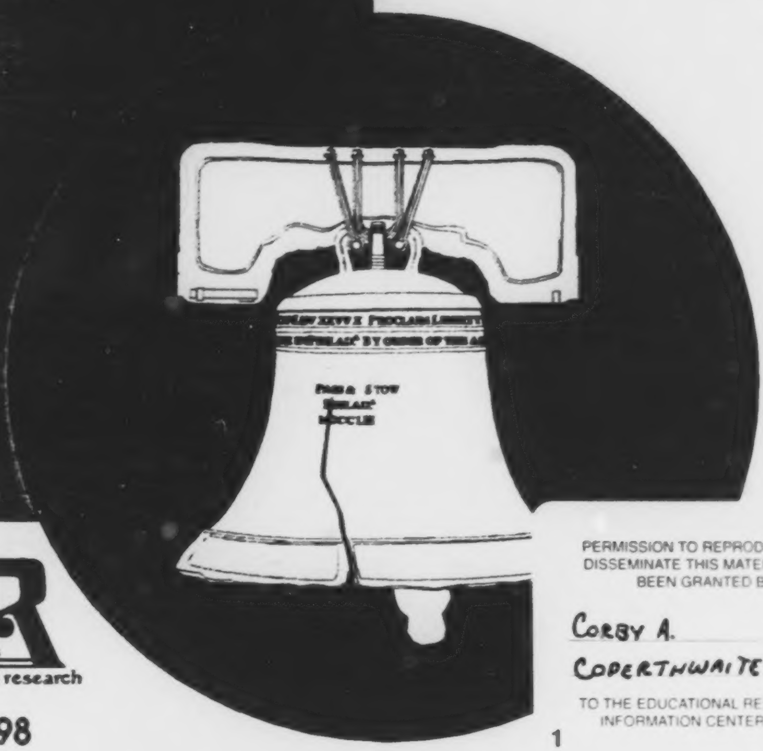
25th Anniversary Conference



NEAIR

north east association for institutional research

November 14-17, 1998

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The Future Is Now:

The Role of Institutional Research in Campus Transformation

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Dear NEAIR Friends and Colleagues:

The 25th Anniversary Conference of the North East Association for Institutional Research was celebrated at the Sheraton Society Hill hotel in the historic district of Philadelphia on November 14-17, 1998. While these *Proceedings* include much of the intellectual content shared at the meeting, they cannot capture the spirit of camaraderie, mutual respect and support, professional commitment, and outrageous fun that permeated the conference.

It is NEAIR's tradition to entrust conference planning and execution to the program chair and the local arrangements chair. Once again, the association's faith in this approach was superbly rewarded. Helen Schneider organized the largest program in NEAIR history, with 14 pre-conference workshops, three general sessions, and over 60 concurrent sessions. Her program theme, "The Future is Now: The Role of Institutional Research in Campus Transformation" was carried forward throughout from Bill Flynn's opening keynote, through Dave Hollowell's general session on Monday, to the closing panel of NEAIR past presidents (Lay, Middaugh, Pagano, Terenzini, and Terkla). Helen's program attracted a record number of presenters, which required some innovative scheduling arrangements, and a near-record 253 conference attendees.

Local arrangements chair Steve Thorpe was equally superb in hosting the anniversary conference. The work of putting on a four-day conference for over 250 people is daunting, and requires a person who is organized, persistent, inventive, and highly skilled in negotiations, team building, interpersonal skills, and follow-through. Steve worked with the staff at the Sheraton Society Hill to deliver a conference that ran smoothly and met all the needs of the attendees. Though my debt to Steve was fully paid when the photos of me in full Mummer's gear were widely circulated, I nevertheless will thank him once again here for all his efforts and look forward to future SIG meetings together.

Brenda Bretz, our extraordinary membership secretary, once again handled all conference registration processes with her usual competence and good humor. The only sad note for NEAIR was that Brenda announced her retirement from this position. So Philadelphia was Brenda's final conference in this role. I join all of NEAIR in thanking Brenda for years of effort in keeping the Steering Committee and conference planners on schedule.

It was my great pleasure to present Fred Volkwein the association's first Distinguished Service Award. Fred's contributions as a scholar, practitioner, and mentor have been of immense value to NEAIR and the profession of institutional research. I was also very pleased that former NEAIR president Pat Terenzini was present to see Fred receive his award. As Fred was first to acknowledge in receiving his award, Pat blazed many of the paths Fred so fruitfully followed.

I want to also thank Pat for allowing me to reproduce his seminal article on the nature of institutional research in our 25th anniversary publication, *Celebrating the past, Preparing for the future*. Pat's article, along with those contributed by Jack Dunn, Fred Volkwein, and Frank Schmidtlein, provided an invaluable primer in IR for newcomers and experienced practitioners alike. Adding in Christine Scarince's history of NEAIR article and the personal reflections essays by 13 charter members and past presidents, *Celebrating the past, Preparing for the future*—beautifully produced by Pat Diehl—became the historical NEAIR keepsake I had hoped for when the idea was first conceived.

Finally, a special thank you to Corby Coperthwaite for agreeing to produce these *Proceedings* for a third consecutive year. Her work in collecting, editing, and producing this document, in both electronic and paper form, is greatly appreciated. Her recent election to the Steering Committee should free her of this task in the future, but NEAIR will continue to benefit from Corby's good ideas and dedicated efforts.

Craig A. Clagett
NEAIR President, 1997-98

1997-98

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***** Emily Thomas', Gayle Reznik's and William Dawe's paper was selected for the Best Paper Award**

Description of The UDAES Project: A Study of Undergraduate Academic Experiences

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Abstract

Many IR officials are involved in assessing the academic transformations that occur on our campuses. This presentation focuses primarily on the research design from the research project, *University of Delaware's Academic Experiences Study* (UDAES). Funded through a National Science Foundation Award, this project documents the effectiveness of the University's Undergraduate Research Program and evaluates its educational affects on students and faculty involved in this program. Data gathered from 265 students in May, 1997 will serve as baseline measures for growth and change over the next three years.

Introduction

Recent calls for evaluation of higher education, especially doctoral-granting research universities (Boyer, 1997), have prompted institutional researchers to become more involved in studies examining and documenting the cognitive and social gains for college students. In addition to documenting levels of satisfaction and use of campus facilities, researchers are contributing to our understanding of how college effects students. Astin (1993), Chickering (1969), and Pascarella and Terenzini (1991) have offered valuable information on characteristics, needs, and developmental changes of baccalaureate students. Terenzini, Pascarella, and Blimling (1996) added to this information by arguing that much learning occurs outside the classroom and that academic and social integration are crucial factors in determining a student's success in college.

Astin (1993) and Pace (1984) believe that students learn best when they invest their physical and psychological energy in college activities. Involvement in extracurricular and cocurricular activities is both qualitative *and* quantitative and when students put forth greater involvement, they reap greater benefits. Students who become highly involved in campus activities will, therefore, acquire the highest level of new cognitive and social skills.

Description of The RAIRE Award and UD Research Design

Funded through a National Science Foundation Award that began in February, 1997, the *UDAES* Project (University of Delaware Academic Experiences Study) is a major component of the RAIRE Award (Recognition Award for the Integration of Research in Educaiton). This award recognizes the institution's success at integrating research in undergraduate education. The award will enable institution officials to engage in a multi-faceted four-year study to document the effectiveness of the University's Undergraduate Research Program (URP) and examine the benefits to faculty and students who become involved in undergraduate research. The major portion of this presentation will be a discussion of the components of this research project. The UD RAIRE Award includes four major components:

I. Summative analysis of student evaluations available at Undergraduate Research Program Office. A sample of approximately 200 evaluations completed since 1982 by Science and Engineering Scholars were examined and analyzed to indicate level of satisfaction, self-reported gains, and the perceived difficulties and drawbacks from students and faculty who have been involved with the URP. Sixteen categories of responses were established in this content analysis, including increased technical skills, working with others, increased desire to learn, and satisfaction with stipend. Overall, the Science and Engineering Scholars reported high satisfaction and positive academic progress as a result of their undergraduate research experience. Ninety-six percent of the respondents reported increased technical skills, 57% said that their research experience helped them learn to act independently, and 45% said the experience was helpful in terms of their future career and/or giving them insight into the graduate schools experience. In addition, only 4% said they did not receive enough attention from faculty mentors, and 14% reported they felt the research stipend was not adequate.

II. Analysis of Impact for Faculty and Graduate Students. Through focus group interviews and/or a questionnaire, data will be gathered from faculty and graduate students who supervise undergraduate students in laboratories to examine their satisfaction and challenges faced from undergraduate involvement in research. This portion of the research project will occur in the 1998-99 year.

III. For Alumni Who Were Involved with URP as a student. A *UD Alumni Survey* was sent to a sample of approximately 2,300 UD alumni, half of whom were URP students. We hypothesized that alumni who engaged in undergraduate research would report higher satisfaction, greater academic and personal gains, and report that their undergraduate experiences were more influential for graduate school and/or career, compared to those students who did not engage in undergraduate research. Alumni satisfaction with the University and the URP, self-perceptions on acquisition of research and other skills through the URP experience will be documented.

IV. Analysis of Impact for Students. For current students, a sample of undergraduate students was identified in Spring, 1997 to participate in the four-year *UDAES* study. Student demographic variables including gender, ethnic, SAT, predicted grade index, age, and number of credit hours attempted divided by the number hours completed will be gathered from the university student records system. Each year, the cohort of students will complete a battery of instruments to monitor level of critical and creative thinking, college satisfaction, and level of campus involvement. Because no one or two instruments were able to capture the information we hoped to gather, we will create an *academic profile* of students with data from the following instruments:

- Watson Glaser Critical Thinking Appraisal (WGCTA)
- Consequences Test (CQ)
- NEO Five Factor Inventory (NEO-FFI)
- College Student Experiences Questionnaire (CSEQ)
- Reasoning About Current Issues (RCIT)

The ***Watson Glaser Test of Critical Thinking*** *(WGCTA)* is a paper-pencil measure that includes five subtests that tap different aspects of the critical thinking domain. The five areas are: the ability to make inferences; recognize unstated assumptions or presuppositions; deduce whether certain conclusions necessarily follow from information in given statements; interpret information by weighing evidence and deciding if generalizations or conclusions are warranted; and evaluate different perspectives and distinguish between strong and weak arguments.

Group norms are available, created from 4,571 adults. The WGCTA reports internal consistency via Cronbach's alpha coefficient $r = .81$, and test-retest reliability $r = .81$ ($p < .001$). Undergraduate students with higher GPAs were found to score better on the WGCTA (Steward & Al-Abdulla, 1989) and relationships have been found between WGCTA and grades in college chemistry (Hurov, 1987), physics (Wilson & Wagner, 1981), as well as GPA, degree attainment, and employment in related field (Hildebrandt & Lucas, 1980).

The ***Consequences Test (CQ;*** Guilford & Guilford, 1980*)* measures the creativity with which one thinks about hypothetical situations. When asked to hypothesize 'what would happen if…', one is asked to list (in a short time period) alternative outcome scenarios for five fictitious problems or situations. Answers to these scenarios indicate the creativity with which one thinks about problems. Answers are either obvious which indicates a direct and immediate result, and displays less awareness of social, economic, and cultural ramifications, or remote which indicates a change that is more distant, either temporally or geographically, or shows a substitute way of adjusting to the changed situation. Creativity is indicated by the combination of greatest number of acceptable responses with largest proportion in the "remote" category, i.e., largest number of solutions that are (1) original and (2) relevant to the problem.

The CQ boasts high stability measures. Split-half reliability was .72 for males; .83 for females (Ibrahim, 1976). Pre- and post-test correlations were found to be .78 (Frederiksen & Evans, 1974) and .69 (Hilton, 1968), and construct validity as evidenced through factor loadings ranged from .41 to .71 for the obvious score and .31 to .70 for the remote score.

Many researchers believe there is a relationship between creative thinking and high intelligence. Goor (1975) found a combination of CQ remotes scores and 'clever' responses to Plot Titles correlated .35 with SAT scores, and Gundlach and Gesell (1989) found significant correlations ($r=.22$) between remote and obvious responses and nonverbal IQ. In addition, Wade (1971) used CQ in combination with other creativity tests and found a correlation of .36 ($p < .001$) with verbal intelligence, and Gordon (1972) found that students who qualified for an honors program were generally more creative as measured by CQ scores and other tests of divergent production.

The ***NEO Five Factor Inventory*** *(NEO-FFI; Costa & McCrae, 1987)* measures five broad domains, or dimensions, of personality and offers insight into how one solves problems and interacts with others. The five broad domains are:

- *Neuroticism* - level of adjustment and emotional stability
- *Extraversion* - level of sociability and consequent behaviors that occur as a result of interactions with others
- *Openness* - active imagination, aesthetic sensitivity, attentiveness to inner feelings, preference for variety, intellectual curiosity, and independence of judgement
- *Agreeableness* - level of sympathy and altruism toward others, eagerness to help.
- *Conscientiousness* - ability to manage impulses and desires and the process of planning, organizing, and carrying out tasks

Internal consistency for the five *NEO* scales was calculated with a sample of 1,539 subjects. Coefficients were .86, .77, .73, .68, and .81 for N, E, O, A, and C, respectively. Convergent correlations (to demonstrate validity to full scales) ranged from .56 to .62. The FFI scale accounted for approximately 85% as much variance in convergent criteria as do the full factor scores. Research indicates that openness is related to intelligence and divergent thinking (McCrae, 1987). Conscientious students are well-organized, purposeful, and persistence and these traits lead to higher academic achievement (Digman & Takemoto-Chock, 1981).

The ***College Student Experiences Questionnaire** (CSEQ; Pace, 1984)* examines students' self-report quality of effort they put forth with various college activities. In addition, it examines students' satisfaction with the campus environment, perceptions of the campus environment (emphasis on scholarly, aesthetic, and vocational issues) and perceived annual gain in a series of academic and personal items.

Cronbach reliability coefficients for the *CSEQ* ranged from .81 to .91, and Guttman-scale analysis and factor analysis for content coherence were very high (Kuh, Vesper, Connolly, & Pace, 1997). Revised (3rd edition) norms were based on 15, 133 students at 18 Research Universities; 50,188 students at 66 total institutions.

Pike (1995) found that student reports of experiences as measured on the CSEQ were highly correlated with achievement test scores. In addition, Kuh, Vesper, Connolly and Pace (1997) found that self-reported gains are greatest for questions related to their discipline or major. Several researchers, including Astin (1993), Ballou, Reavill, & Schultz (1995); Bauer (1992; 1997) and Pace (1981; 1986), found that students make larger academic gains when they are involved in campus activities.

The ***Activities and Interests Inventory*** was created to document the kinds of extra-curricular activities, level of involvement, and amount of time students report spending on each during the year. It offers additional information on specific activities (i.e., sports, clubs, community volunteer activities, and employment) and determines whether URP students have the same experience with extracurricular activities as non-URP students.

The ***Reasoning About Current Issues Test*** (RCIT; Wood, 1997) is designed to measure one's level of epistemological thinking and is based on King and Kitchener's (1994) Theory of Reflective Judgement. The *RCIT* is a paper-pencil survey that examines students' beliefs about the nature of knowledge and learning and their personal epistemology. Items are categorized into five more or less independent dimensions, beliefs about the structure of knowledge, certainty of knowledge, source of knowledge, control of knowledge acquisition, and speed of knowledge acquisition.

Survey Administration

In the Spring, 1997, a letter was sent to each new freshman student in select majors asking them to join this study. Of the approximately 500 letters sent to freshmen, 265 students met with me during March, 1997 to complete the set of profile instruments. Four meetings times were designated and most of the 265 students met with me during this time. For those who could not attend the group meeting, I scheduled individual meetings to have the student complete the set of instruments. Table 1 shows the breakdown of instruments completed each year. As shown, due to the stability of the NEO outcome, it will be administered only once (during the freshman year). The WGCTA will be administered in years one and four only. The CSEQ, CQ, and Activities & Interests Inventory will be administered each year, freshman through senior years.

Hypotheses for UDAES Study

We hypothesize that the research experience will initiate or support students' active participation in the learning process. We hypothesize that students who are involved with URP will have higher persistence rates, earn higher grades, sharpen their ability to synthesize information, think more critically and creatively, become more sophisticated about the problem-solving process, and frame issues in a broader context. In addition, greater participation in learning and an understanding of the nature of knowledge will allow the UR student's personal epistemology to become more complex. Specifically, our hypotheses for the UDAES study are that students who engage in undergraduate research will:

- have higher persistence and graduation rates;
- select more challenging courses of study;
- develop a greater ability to synthesize information;
- think more critically and more creatively;
- become more sophisticated in problem-solving;
- develop greater tolerance for ambiguity;
- frame issues in a broader context;
- develop greater investment in their academic growth; and
- develop greater attachment to the University community.

Data Collection

Data for the students in undergraduate research will be compared with a matched sample of students who do not engage in undergraduate research. A total of 265 second semester freshmen completed Year One instruments in May, 1997. This cohort of students will be followed throughout their baccalaureate work at UD and asked to complete select measures at the end of each academic year. It is hoped that approximately one-third of this cohort will become involved in URP, beginning in summer or fall, 1998. Data collected will enable me to chart annual progress and differences between URP and non-URP students.

Summary of Year One Findings

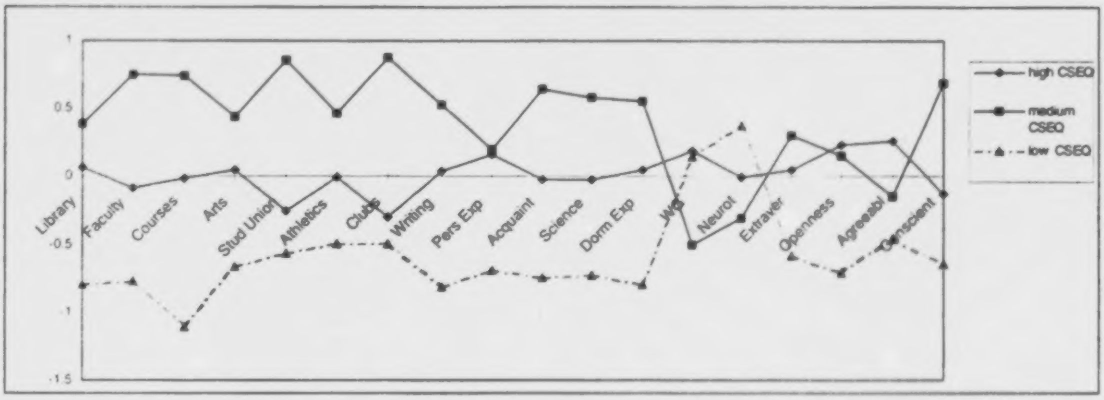
Data was obtained from 265 freshmen in May 1997. Fifty-eight percent were women, 77% were white, 35 % honors students, and were majoring in Chemical, Civil, Electrical, and Mechanical Engineering; Computer Science; Chemistry; Biology; Animal Science; Psychology. The mean SAT score for the group was 1,202, and their average cumulative GPA for Spring 1997 was 3.02. A preliminary cluster analysis revealed three distinct levels of effort or involvement for UDAES students based on CSEQ scores (see Figure 1). Data from the completed UDAES students in May, 1997 will serve as baseline measures for future academic growth and change over the baccalaureate experience. We will chart change from year to year as well as freshman to senior year change.

Table 1
Instruments Used to Create Academic Profile

Instrument:	Measures:	Administered When:
College Student Experiences Questionnaire (CSEQ)	level of involvement and quality of effort in campus activities	each spring
Consequences Test (CQ)	the creativity with which one thinks about hypothetical problems	each spring
Activities & Interests Inventory	the kinds and frequency of student involvement in extracurricular activ., employment, research activities	each spring
Watson Glaser Critical Thinking Appraisal (WGCTA)	five aspects of critical thinking - inference, recognition of assumptions, deduction, interpretation, & evaluation of arguments	freshman and senior years
NEO Five Factor Inventory (NEO-FFI)	five domains of personality. Offers insight into how one solves problems and interacts with others.	freshman year

Figure 1

Exploratory Cluster Analysis, Year One CSEQ, WG, and NEO-FFI



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TRANSFORMING YOUR CAMPUS:
MIXED METHODOLOGY IN INSTITUTIONAL RESEARCH

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Abstract

Researchers play crucial roles in campus transformation via information. This information must best represent their institution's reality. By combining data collection methods, researchers can help to isolate leverage points for change. This paper reviews multiple methods, discusses data integration, and gives an example where mixed methodological research induced successful transformation.

Transforming Your Campus: Mixed Methodology in Institutional Research

Institutional researchers can play a critical role in transforming their campuses by providing information that can serve as the foundation for institutional change. It is important, however, that the information they provide best represents the reality of their institution. When given a request for data regarding a current problem, too frequently researchers respond with the "best numbers" presently available in institutional databases. This practice results in reports that are related to the problem but do not quite meet the needs of decision-makers or answer the original question. Certain issues require a more careful approach where researchers should contemplate all available research methods and data before choosing those that will yield the most accurate and pertinent information.

There are two issues that specifically impact the roles of institutional researchers in campus transformation. First, higher educational institutions serve a special role in their environments. In higher education, transformation is a process of change that specifically focuses on individuals. As opposed to a factory, where changes in assembly lines or chemical processes can lead to substantial transformations in products, educational institutions provide services that depend on interactions among and within human beings. Transformation in this environment depends heavily on the evolution of the mindsets and realities of those that provide the education and those that render the support services that complement learning.

The second issue that impacts the roles of institutional researchers relates to what is perceived to be real in their institutions. Often, there is an expectation of a single organizational reality. Researchers tend to investigate stable, unidimensional traits in each institution and assume that all employees perceive the campus in the same way. A more accurate description is that there are always multiple institutional realities and that each individual, whether on or off campus, has a unique perception of the institution. A portion of this perception may be shared and groups may have considerable collective perceptions. Understanding the differences and commonalties in perceptions of the campus can help guide more advanced research and transformation strategies. Research strategies then, should address these multiple institutional realities.

What then, given these two issues, is the role of institutional research? Our suggestion is that institutional researchers focus on creating a shared institutional reality by educating and involving institutional members (faculty, staff, administration, and students) in dialogue regarding issues leading to campus transformation. The strategy discussed in this paper is to provide more complete information through mixed methodology.

What is mixed methodology?

Mixed methodology research utilizes multiple methods (typically both quantitative and qualitative) in an attempt to obtain the most complete picture possible of the phenomena of interest. This approach provides researchers and decision-makers at an institution with a more comprehensive, multi-perspective understanding of the issue under investigation than any one single method alone could provide. The complexity of many educational institutions' decisions can be more fully addressed by combining quantitative methods' ability to produce a panoramic view with qualitative methods' capability of obtaining an in-depth description. By integrating multiple data collection methods, researchers can more accurately and thoroughly depict their college or university and the issues that surround the problems at hand. The next few paragraphs explain what data sets are and give an overview of how methods can be mixed.

While many investigations rely on a single data set to provide an answer to a research question, mixed methodological inquiry involves the use of multiple data sets. Multiple data sets emerge when various data collection strategies are employed. Two sets of data retrieved from the same method, then, could not be considered multiple data sets. In other words, a researcher who uses data obtained from two different administrations of the same survey instrument is not applying multiple data sets. One set of data obtained from the survey and another procured via a database extraction, however, would constitute multiple data sets.

In mixed methodology research, as in all research, the first step must be to identify and define the research question. Once the research problem has been established, the next step is to decide what type of methodology is most fitting to the situation. Given the variety of designs, certain methods are more appropriate than others. When the research question is of the "what," "who," "when," or "where" variety, quantitative measures are usually the method of choice. For instance, for questions such as where incoming freshmen come from geographically, or what percentage of biology majors have a 3.0 GPA or higher, an extraction from existing databases and descriptive statistics should suffice. If, on the other hand, the research question is of the "why" or "how" nature, qualitative or more advanced quantitative methods are typically appropriate. If, for example, the question surrounds issues of how students might react to a new campus policy, qualitative research techniques such as interviews or focus groups would prove useful.

In today's complex higher education environments, the research problem is often of a nature that warrants mixed methodology. Because of the time one must invest in order to conduct mixed methodological research, the researcher must determine, quite frankly, if the problem is worth the attention. If it is a complex yet critical issue, then mixed methodology is probably in order.

Perhaps the most important advantage of conducting mixed methodological research is having the ability to investigate phenomena from various vantage points and in different ways. Mixed methodological research, then, can be likened to taking a journey; the descriptions of this trip by an individual who took an airplane to reach a destination will be very different from those of someone who walked to that same destination. The view from the airplane allows the traveler to see quick glimpses of a lot of things in a short period of time. He or she may be able to recount, for instance, within one hour seeing five bodies of water, but may not be able to describe much beyond that. While the experience of the walker is much slower, thus preventing the observance of many things at once, those things that the walker does observe are observed in greater contextual and personal detail. Mixed methodological research is like asking many who have traveled the route to describe what they saw. It should be clear that when all of the various descriptions are combined, a very comprehensive picture is drawn. One person's account is not more or less correct than another person's, just very different. Quantitative and qualitative research methods are not competitors, then, but complements of each other. Each type of research, when used well, has the ability to uncover facts or perceptions that the other method, due to its very nature, would probably have not unearthed.

A Review of Quantitative Methods

Quantitative methods such as descriptive and inferential analyses adhere to stringent procedures that include sampling, manipulation, and control. Consequently, the results obtained via quantitative means are generalizable to a larger population. The strength of quantitative measures lies in their standardized and numerical results that are appropriate for statistical analysis. The data collected can identify relationships among variables and depict the characteristics of populations. Quantitative research methods are a fundamental component of social research today. At times, the information needed by an institutional researcher, such as enrollment figures and demographic information regarding students at the institution, is already available in a campus-wide database. While other quantitative techniques are important, most of the day-to-day investigations of the institutional researcher are composed of the statistical manipulations of data extracted from databases.

A commonly used technique in quantitative research endeavors is the survey. Because many of the instruments employed in survey research are standardized, the results can be generalized to a population beyond those that were surveyed. By utilizing standardized instrumentation, the researcher can acquire a great deal of information (about a large number of people) relatively quickly and easily. Standardization is not only a prerequisite to achieving reliable results, but allows researchers to compare and contrast results across groups of individuals who responded to the survey instrument.

Experimental research, perhaps because it requires manipulation and control, is not typically used in institutional research. Institutional researchers, instead, tend to focus on phenomena as they already exist. For this reason, quasi-experiments are more likely to be used in institutional research settings. In quasi-experimental research, the investigator looks at differences between two populations that are as similar as possible in all characteristics except for the one of interest. The researcher, then, is able to attribute, with some level of certainty, differences in the dependent variable between the two groups to the one salient pre-existing difference in their characteristics.

Similarly, an investigator may choose to acquire data via direct observation. Direct observation, unlike survey research that requires participants to state their opinions, requires the researcher to record the behaviors of other individuals. The researcher can then develop a data set based on the frequency of these occurrences.

Analyzing quantitative data sets involves knowing when and how to apply the appropriate statistical procedures. When description is in order, the researcher must calculate, generally with the help of statistical computer software, frequencies, distributions, measures of central tendency, graphs, and tables. These descriptive statistics provide a good first look at quantitative data. When the researcher aims to discover if and to what extent variables in the data set are related to each other, or co-vary, a correlation is the statistic to be used. Correlations, conducted easily and quickly with programs such as SPSS, tell the researcher the extent to which change in one of the variables of interest is associated with change in the other variable.

When the researcher is interested in comparison between or among groups, inferential statistics are required. The researcher conducts T-tests when looking at the differences between two groups and ANOVA when interested in the differences among more than two groups. These statistics, in sum, provide the researcher with a number that states whether or not the differences in the dependent variable between or among the groups can be attributed to the independent variable and with what level of certainty the researcher may accept these results. These comparative statistics, while commonplace in certain areas of applied psychology, are utilized less frequently in institutional research, because they tend to be applicable to experimental or quasi-experimental data.

Regression analyses are appropriate when prediction is the desired outcome. Linear regression analysis, for instance, allows the researcher to ascertain in what way a change in one variable is associated with change in the other. Namely, if the investigator knows the relationship between two variables (represented by an equation), he or she can predict the value of one variable if the value of the other is known. An institutional researcher who is interested in the relationship between SAT scores and college GPA, for instance, can develop a linear regression model involving these two variables. Then, if a student's SAT score is known, the researcher can insert it into the equation, and determine what the student's college GPA will be. Other types of regression operate by the same principle (prediction of one variable based on the other), but involve different statistical procedures. Through logistic regression, for example, the researcher attempts to find what variables, when taken together, are the best predictors of a single categorical variable. Other statistical procedures, occasionally used in institutional research, include multivariate statistics, factor analysis, and structural equation modeling.

Regardless of the statistical procedure used, the quantitative research process can be compared to viewing a painting in an art museum. Upon looking at the picture, the quantitative researcher would most likely step up close to the painting to scrutinize the individual dots of paint that comprise the picture. He or she might look closely at the characteristics of the artwork, counting how many dots the painting is made of and recording what color they are. The quantitative researcher recognizes that it is only after obtaining a detailed and thorough account of the characteristics of the painting that the picture may be fully understood.

A Review of Qualitative Methods

Qualitative methods, in contrast to quantitative methods, investigate phenomena as they occur naturally, without researcher manipulation, dissection, or quantification. The information obtained, while less generalizable, provides a deeper understanding of the particular issue of interest and can identify issues sometimes hidden in structured quantitative research. Qualitative methods include interviews, focus groups, case studies, ethnographies, and historical analyses. Although quantitative methods are often useful to institutional researchers, sometimes the research question that needs to be answered requires a qualitative research method instead. Namely, qualitative methods are appropriate when information other than statistics and demographics is desired. A research problem involving non-returning students, for instance, could be studied quantitatively. The researcher could study the characteristics of students who left the university versus those who continued their studies. Tests could be performed on the data to see if differences between the two groups were statistically significant. But if the researcher wanted to find out *why* the students decided to leave or remain at the university, a different type of investigation would be necessary.

Researchers may opt to study historical texts and documents in their attempt to find out why students leave the university. This approach, which allows for virtually no interaction with individuals, relies on previously written materials to help explain why a phenomenon occurred. Historical research may uncover invaluable information - information that would not likely be attainable through other methods. A researcher, for instance, may locate multiple newspaper articles written about violent crimes in the area that were published in the same year that many female students left the university. Although it has the potential to place events in a meaningful context, historical research is rarely used by institutional researchers, perhaps because the issues they are interested in are happening concurrently with the study, or perhaps because of the heavy interpretive responsibility placed on the historical researcher.

On the other hand, by conducting interviews, the researcher can ask the students why they left. These interviews would most likely be conducted via telephone since the students are no longer enrolled at the institution. Interviews allow researchers to obtain valuable and personalized information from a primary source. In addition, the interactive nature of the interview allows the researcher to ask probe questions to ensure that an adequate amount of information is secured and clarifying questions to assure that the data obtained is accurate.

Focus groups are similar to interviews but allow researchers to obtain data from several individuals at once. Typically, focus groups consist of about eight to ten randomly chosen individuals who are asked to participate in the focus group because of their inclusion in a certain group. For instance, members for a focus group might be randomly drawn from all of the freshmen that left the university in a given year. Moderated and directed by a trained facilitator, focus groups are unique in that they allow a forum for open discussion about a specific topic. As a result, researchers may not only obtain responses to the questions they ask the participants, but may also accumulate knowledge based on the interactions among group members and the conversations and questions that ensue.

Surveys, one of the hallmarks of institutional research, can be thought of as a brief interview with many people at once. Surveys can be used to gather both qualitative and quantitative data. The strength of survey research is its ability to obtain vast amounts of information in a relatively short period of time. The chief limitation of survey research may be its lack of depth. Whereas an interview can be thought of as the process of digging a very deep hole with a very small diameter, the survey can be likened to scratching the top of a very large surface. Although usually not as singularly focused as interview or group sessions, surveys have the potential to investigate phenomena in-depth through the use of open-ended questions. Currently, surveys are frequently employed when an institutional researcher aims to learn about the attitudes and opinions of student, employee, or alumni populations.

Observation, in contrast, involves little or no interaction between the researcher and the participants. By allowing the researcher to observe and record events as they naturally occur, without researcher manipulation or intervention, a genuine picture of reality can be obtained. As with all qualitative methods, however, researchers must be extremely open to what they find and must be vigilant in not allowing assumptions and biases to taint the data.

Whereas the researcher engaging in direct observation maintains a certain distance from the individuals under investigation, ethnographers immerse themselves in cultures of interest. The ethnographer, then, observes and experiences events and phenomena from within the context in which they normally take place. This inside position allows for a unique understanding not permitted by other research methods. From our experience, ethnography appears to be rarely if ever used in institutional research although it may be an interesting avenue to pursue in future endeavors.

Once the qualitative researcher has obtained a valid and reliable data set, an important next step is to make sense of the findings. This stage is perhaps the most challenging one in qualitative endeavors. Not only is the researcher faced with an overwhelming amount of data, but also is responsible for drawing out meaningful and useful information. Unlike quantitative research methods that rely on the researcher's (or their computer's) statistical prowess to analyze numerical data sets, qualitative methods rely on the expertise and insight of the researcher to synthesize and understand textual data. The results of qualitative research, then, are primarily dependent on procedures internal to the researcher.

Through content analysis, the researcher organizes the data into broader themes and issues. The qualitative researcher searches for structures and patterns and makes inferences based on these regularities. In qualitative research, the goal of analysis is to reorganize the data into categories that allow for comparisons within and between these categories and to develop possible theories. Computer software such as CETA, Ethnograph, HyperQual, and QualPro assist the researcher with qualitative data analysis, typically employing a content analysis technique to code textual data. They are the qualitative counterparts to statistical programs such as SPSS and SAS and are often compatible with such programs. Qualitative data analysis software allows the researcher to conduct statistical analyses on non-numerical data. One of the advantages of qualitative data analysis software, like its quantitative counterpart, is the time it saves the researcher. Another strength is the program's neutrality; a computer program is less likely to insert biases into the analyses than a human being who is personally analyzing the data.

Regardless of the specific method used, the analytic process in qualitative research is contingent upon a capable researcher who has the ability to understand what individuals are trying to communicate. In this aspect, qualitative research can be compared to a painting hanging in an art museum that appears to consist of nothing more than thousands of independent dots of paint. Once the viewer steps back and looks again at the overall painting, however, a picture emerges. In this sense, it is only after one comes to understand the context of the bigger picture that the dots themselves are given meaning. The qualitative researcher loses the information associated with the number of dots, type of dots, and materials used in the painting, but gains an appreciation for larger patterns and holistic meaning. The qualitative researcher, then, must have the ability to look at an overwhelmingly large amount of seemingly separate data points and see the picture they form.

How are Research Methods Integrated?

Mixed methodology research begins with the research issue or problem. From that point, a research design strategy is developed that includes at least two but sometimes many sets of data. Importantly, these data must be multidimensional in the manner of their collection, comprehensive to include possible divergent perspectives on the problem, and investigative to the point that the research may uncover "sleeping" or hidden facts or perceptions that impact the issue. The results of such research go beyond mere data tables or graphs. It is important that a report be generated *and* dialogue initiated that present the multiple findings and synthesize meaning to most fully represent issues that face institutions (Tashakkori and Teddlie, 1998).

Using Multiple Methods and a Single Data Set

There are three possible ways to apply multiple methods to a single data set. One is to use two or more different quantitative techniques to extract meaning from the data. Let's look at an example where an institutional researcher is assisting a faculty member in analyzing their teaching methods in relationship to student performance. The data set in this example consists of an ability measure (e.g. SAT scores) and course grades in two different sections where the faculty member applied two different teaching methods. The data could be analyzed in two different quantitative ways. One could be to analyze the variance in grades within and between the two groups to determine if they significantly differed when controlling for the ability measure (ANOVA or ANCOVA). A second way could be to use a regression analysis to determine the linear relationship between ability measure and grade, and then compare this relationship between the two groups. Additional applications of quantitative methods exist for this data set, each yielding its own unique information.

Using the same example, let's explore the use of quantitative and qualitative methods. At the end of the semester, the faculty member administered an assessment instrument that measured the students' perceptions of the teaching methods through narrative responses to questions. A quantitative technique may be to categorize the students' responses into predetermined categories, number them, and then compare differences between groups based on the two teaching methods (maybe using a T-test). A qualitative analysis may involve a content analysis of the narrative responses in order to explore emerging issues identified by students and to investigate whether patterns in those issues differed in nature between the two classes.

Finally, a data set could be analyzed by multiple qualitative methods. Using the same data from the narrative responses above, a first analysis may be used to explore emerging issues as before. A second analysis may be designed utilizing information obtained in the first to further explore the teaching methods. For example, the identified emerging issues could be used to profile students within the two classes to determine whether these methods appeared to differently impact different types of students.

Using Multiple Methods and Multiple Data Sets

Mixed methodology research becomes even more potent, however, when more than one data set is put to use. While only three possibilities exist when mixing quantitative and qualitative methods for any one data set, infinite possibilities exist when using these methods on more than one data set. While it is beyond the scope of this paper to detail the many types of mixed methodology research (see Tashakkori and Teddlie, 1998), let's look at the prior example of the faculty member teaching methods to show the increased explanatory potency of mixing methods with multiple data sets.

One possible design for a mixed method approach to the research problem could consist of mixed quantitative and qualitative methods using the ability measures, course grades, and narrative responses. Initially, three quantitative analyses could be conducted to include statistical group comparisons in grades, in ability measures, and in categories of narrative responses. This could be followed by qualitative content analyses of narrative responses and identification of emerging issues. The difference between this multimethod approach and those described in the last section stems from the integration of findings from the two data sets. The results must be synthesized by the researcher before they are communicated to the community concerned with the issue.

Researchers have noted the possibility of "paralysis by analysis" when multiple computations lead to a near stoppage of a project. This is obviously a caution, but using multiple data sets can help to ease this concern. Increasing available data rather than increasing analysis will help to add perspective to the project, diversify data sources, and allow for facts to be uncovered that may have been missed with fewer data sets.

Following Through

The critical and final phase of any research project is writing the report and communicating the results. This phase becomes even more important in mixed methodology research. The consuming task of this phase is integrating and synthesizing the results and meaning that are developed from multiple methods. Analyzing and writing the results given a singular data set is a rather straightforward task for an experienced researcher. Techniques such as analyses of variance, regressions, and content analyses have recognizable patterns in their narratives that can be replicated with different data; but when multiple methods are used with more than one data set, the task changes. Now, holistic meaning of the phenomena at hand becomes important. There are no pre-established routines for synthesis; researchers find themselves constructing the reality that is best portrayed by the results.

Often the final step to single data set research is the production of the research report. The report can be sent out to interested parties who can read and understand the findings. In mixed methodology research, this technique must be modified. Since the aim of the report is to construct a reality based on the information, follow-up is necessary to facilitate the sharing of this reality by those concerned with the issue. Understanding their perspectives and concerns become relevant and the presentation and dialogue regarding the report become paramount. Mixed methodology research designed to lead to campus transformation should not end with the production of the report, it should continue with dialogue that leads to a shared understanding of the meaning surrounding the original research issue.

An Example of Successful Mixed Methodology Research

The problem

One example of the effective use of mixed methodology research was a recent study conducted at Shippensburg University. An external auditing office noticed an exception with the awarding of graduate assistantships with some inequity in tuition awards. The practice was to award a full tuition waiver to all students who had a graduate assistantship. The students would then work a certain number of hours for an hourly salary. Over time, the number of required hours began to vary and two types of assistantships, full-time and part-time, emerged. Both types, however, received a full tuition waiver. An inequity existed in that full-tuition waivers were given to students who may have only qualified for a half-time waiver.

Design Strategy and Conducting the Research

A multimethod design was constructed that included quantitative data from the student record database, quantitative data from the human resources salary database, quantitative and qualitative data from a survey of graduate assistants and their supervisors, and qualitative data from interviews with campus personnel. Initially, the office of Institutional Research and Planning conducted several quantitative analyses on the program's cost and the workload that the graduate assistants in the program contributed to the university. Guided by the goals of minimizing cost to the university, maximizing benefit to the student, and maximizing the students' workload contribution to the university, linear programming was used to develop six possible scenarios. (Linear programming is a quantitative method with the objective of maximizing or minimizing some quantity given a number of boundaries or constraints.) The scenarios varied the number of graduate assistantships, the number of hours required by the assistantships, the amount of the tuition waiver, and the hourly salary. These data, however, were not sufficient to fully address the problem.

A survey assessed student attitudes and opinions regarding the impact of the six scenarios. In addition, those departments that employed graduate assistants were surveyed regarding their preferences for the scenarios. The results from the surveys were analyzed using descriptive analytical techniques (quantitative) on the likert scale questions and using content analyses (qualitative) on the open-ended questions to isolate emergent issues.

Synthesizing Data

The final synthesis combined the results from these mixed methods into possible solution scenarios based on the utility of the quantitative models and the perceived preferences based on the attitudes and opinions of those involved. From the financial perspective, the quantitative data showed that one scenario was clearly superior in that it lowered costs to the university and maintained an adequate generation of workload by the graduate assistants. Student and employer opinion, however, showed this scenario to be rather unfavorable because graduate student enrollment might decline. Combining the results showed that a more moderate financial scenario was more highly favored that provided a lower cost than the present policy, maintained the necessary workload, and removed the inequity between full-time and part-time graduate assistants.

Presentation

The report was discussed individually with executive managers with the explanation of the quantitative advantages of the scenarios and the perceived impact each would have based on the survey results. Specifically, the discussions focused on the optimal costs of the program to the institution, the contributions to workload that the graduate assistants provided, the financial support that the program provided to graduate students, perceptions of the graduate assistants' supervisors, and the perceived popularity and attractiveness of the program to potential and continuing students. Further issues emerged from these informal interviews and the report was modified to include additional information. The final report was presented to a group of executive managers who engaged in dialogue on the issue. One of the recommended scenarios was selected and a new policy was written based on the research. Importantly, the new policy was financially viable, satisfied both students and employees, and appeared reasonable to management.

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FACTORS AFFECTING GRADING PRACTICES

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INTRODUCTION

The current research interest in grading practices was triggered by a mounting concern over grade inflation in American educational system (Zangenehzadeh, 1988; Summerville et al., 1990; Franklin et al., 1991; Agnew, 1993; Hensley, 1993; Farley, 1995; Arenson, 1997; Yardley, 1997). A common understanding of the definition of grade inflation is that "students receive higher grades than their predecessors without a corresponding rise in achievement" (Yardley, 1997).

This definition seems to have set the tone for most of the studies on grade inflation: first, many researchers went after the trend of grading patterns, trying to decide whether grades indeed increase over time; second, many researchers have focused their attention on the question of whether students actually learn more to deserve higher grades than their predecessors (Zangenehzadeh, 1988; Franklin et al., 1991; Agnew, 1993; Hensley, 1993; Arenson, 1997; Scocca, 1998; Marklein, 1997a; Mullen, 1995). As a result, many have provided ample evidence to have successfully validated (e.g., Summerville et al., 1990; Farley, 1995) or dismissed (e.g., Adelman, 1995; Olsen, 1997) the public suspicion of grade inflation. These research efforts have laid a solid foundation for further studies on this subject.

However, a careful review of literature lead us to believe that there are at least two conceptual issues that have not been sufficiently addressed. First, the term grade inflation is problematic in a context that an objective standard is absent. Grades are measures of educational achievements, but they only make sense on a comparative basis. Comparisons can be made under unified or standardized conditions. The problem is, except for some nationally or internationally standardized tests (e.g., GRE and TOEFL) and various state-administered professional license examinations, classroom and non-classroom assessments are not standardized. Second, considerable amount of time and energy has been devoted to examine the correlation between student performance and their grades while they do not even participate in this measurement activity known as grading. In other words, since autonomy is a highly regarded value in higher education, grading will remain a faculty prerogative. The grading criteria and the factors affecting them would vary from campus to campus, from department to department, and even from classroom to classroom. Strictly speaking, what the grades tell us applies only to the students who are taught and tested exactly the same way.

Therefore, this study was not designed to add another piece of testimony to the existing literature dismissing or validating the accusation of grade inflation. Nor do the authors of this study have any intention to prove how well our students have done to deserve the higher grades, for the absence of absolute criteria will make this kind of arguments sound powerless. Instead, this study was designed to probe into the issue by asking what are the potential factors that would affect faculty grading practices. The purpose is to provide some necessary knowledge for public understanding and faculty awareness of the problem, and for policy intervention if this is ever deemed desirable.

RESEARCH QUESTIONS

In early 1998 in response to the request of a Board Committee of a large urban university system, the University Chancellor sent a memo to all the colleges asking for information regarding patterns of grading and grade distribution. Administrators at one of the University's colleges responded by conducting a series of formal and informal interviews with department chairs and faculty members and compiling grading data over the past ten years. Two conclusions were drawn from this preliminary probe: 1) grades have increased over the past ten years at the College, and 2) faculty grading practices, instead of student academic preparation or performance, are the source of the problem that needs to be addressed (Springer, 1998). Consequently, some key factors were extracted from both grading data and interview results for an in-depth analysis.

Since grading has always been considered to be a faculty prerogative (Kimmich, 1998), it is natural to ask directly how instructors would evaluate students. Many faculty members interviewed indicated that they generally do not grade on a curve but rather mastery of the subject matter and performance of the students. "Experience over time determines faculty judgment of what constitutes mastery of subject matter and, consequently, the assignment of grades according to levels of performance within college grading policies" (Mirrer, 1998). Therefore, it seems to be a reasonable assumption that faculty experience or seniority affects grade distribution. But we are not too sure about the direction of this hypothesis, since experience may help prevent grade inflation while the sense of security associated with tenure may also lead to ignoring college grading policies.

There is another question as to whether the increased use of adjuncts may affect grading patterns (Mirrer, 1998). Specifically, there is a belief that adjuncts grade higher (Cheng, Hartman, Podell, & Zeldin, 1998). We would like, therefore, to examine the academic data as to whether there has been a difference between full-time and adjunct faculty in grading practices.

For students, increases in grades may have to do with the pattern of course-taking (Kimmich, 1998). It has been suggested that students understand and are adept at "using the system" (Kimmich, 1998): grading patterns may be skewed when greater numbers of students opt for courses in which grades tend to be higher, or where the grading tends to be more subjective, such as those in the humanities, as opposed to courses in math and science, where the measures are more objective (Mirrer, 1998). In other words, grading patterns differ by discipline or department (Summerville et al., 1988; Cluskey et al., 1997). This is the third potential factor to be tested in the present study.

With grading data broken down by course levels (e.g., lower, upper, and graduate divisions), different grading patterns emerge. Therefore, the fourth factor we want to test is whether higher course levels associated with higher grades.

There are many other hypotheses that are also worth formulating and testing. However, given the fact that most research projects on grade inflation are driven by the practical need of administrators to address concerns from their constituencies, this type of study is often *ex post facto* with data drawn from administrative databases. Oftentimes institutional researchers do not have the luxury of time and resources to conduct in-depth surveys. The present study was to demonstrate an institutional research effort that focuses on utilizing existing institutional data that can explain grading practices. Specifically, this article examines the following four research questions:

(1) Do adjunct faculty award higher grades than full-time faculty?

(2) Do junior faculty award higher grades than senior faculty?

(3) Are grades generally higher in the humanities and social sciences than in science and technology disciplines?

(4) Are grades generally higher in upper division courses?

METHODS

Data Sets

Using one college as a case study, the empirical data were obtained from the campus-wide student information system. A working data set was constructed by extracting and combining data from different academic and administrative databases. The two main sources of data were the Course Masters File and the Course Card File.

Designed as a preliminary study of the complex issue, the project was conducted as a cross-sectional study of various potentially important factors associated with grade distributions within the College. To validate the research results, this kind of "snapshot" approach to one semester's data should be repeated for a number of times. The data analyzed in this study covered the fall semester of 1997.

Recognizing the fact that students normally do not participate in grading decisions (with such exceptions as W's, i.e., withdrawals), student identification and other characteristics are removed from the database. Meanwhile, the data file containing faculty characteristics such as their full-time/part-time status and ranking was merged with the main grade file. Using the summary function of database software (in our case, PARADOX), each grade is recorded as a separate "grading event" and the identical ones are summarized as "counts," or the number of events. In the actual analyses, the variable "count" served as a "weight," which is available in both SPSS and SAS.

Analytic Procedures

First, bivariate analytic procedures used in the study included Cross-tabulation and T-Test. Second, the techniques of "quasi-multivariate analysis" or elaboration (Chen, 1998) were performed by applying statistical control where a relationship was suspected to be spurious in order to clarify the net effect of a potential causal influence. Finally, a multiple regression was conducted to verify the findings from the previous two steps.

Since we included all the grading events on the roll of the Fall semester of 1997, we did not need to make any statistical inference using these procedures. The inferential results would only make sense when the data were supposed to constitute a random sample. Yet in research practices, tests of significance are widely used to analyze nonrandom data, and some argue that significance at least points to the presence of a relatively considerable effect (Chen, 1998). The inferential results included in the following should only be interpreted in such a manner (i.e., for a hypothetical random sample of a larger population).

RESULTS

Collegewide Grade Distribution

Altogether, there were 31,916 grades/grading events recorded for the Fall of 1997 at the College. Table 1 breaks these grading events into three distinctive groups: (1) regular grades ranging from A to F, grouped into high, medium, and low/failing grades; (2) the grades of official and unofficial withdrawals and "incomplete;" and (3) Non-judgmental grades. Overall, excluding non-judgmental grades, close to 50 percent of the grades awarded in Fall 1997 were on the higher end of the grading spectrum (B and up), nearly one-quarter of the grades, medium (C to B-), and 8 percent, low/failing (D and F).

Bivariate Analysis

Full-Time vs. Part-Time (Adjunct) Faculty. A total of 594 faculty members were involved in grading and included in the study. Of the 594 faculty members, 218 (36.7%) were full-timers, and 376 (63.3%) were adjuncts (part-timers). Full-time faculty were responsible for 15,440 grades/grading events, which account for 46.8% of the total. Adjunct faculty were responsible for 17,544, or 53.2% of the total grades/grading events.

Table 2 clearly indicates that, measured by mean quality points per credit, adjunct faculty gave average grades 0.107 point higher than full-time faculty. Table 3 shows that adjunct faculty gave more high grades than full-time faculty (52.1% vs. 46.7%), and they gave fewer low grades than full-time faculty (7.4% vs. 8.6%). Row percentages are used in Table 3 to facilitate such comparisons. The results indicate that adjunct faculty give higher grades than full-time faculty.

It is noticeable that while students withdrew officially from full-time faculty's classes at a higher rate than that from adjuncts' (10.3% vs. 8.1% of W's), a higher proportion of students received a grade of unofficial withdrawal (WU) from adjuncts. In addition, full-time faculty seemed to be more willing to give an incomplete grade (5.4%) than adjuncts (3.8%).

Faculty Rank/Seniority. Of the 218 full-time faculty members, 69 were full professors, 71 associate professors, 67 assistant professors, and 11 under other titles such as lecturers. Senior faculty (full and associate professors) were responsible for 9,116 grading events, which account for 60.2% of the all the grades given by full-time faculty. Junior faculty (assistant professors and faulty with other titles) were responsible for 6,016, or 39.8%, of the subtotal of grades/grading events.

Table 2 shows that, measured by mean quality points per credit, there was no significant difference between junior and senior faculty in assigning grades. In Table

3, a chi-square test confirmed the fact that no significant difference existing between junior and senior faculty in grading practices.

Table 1. Grade Distribution and Grouping

Grades and Grouping			Quality Points per Credit	Frequency	Percent
Regular Grades					
	High	A	4.0	5,115	16.50%
		A-	3.7	2,916	9.40%
		B+	3.3	3,362	10.80%
		B	3.0	3,970	12.80%
		Subtotal		15,363	49.60%
	Medium	B-	2.7	2,267	7.30%
		C+	2.3	1,992	6.40%
		C	2.0	2,918	9.40%
		Subtotal		7,177	23.20%
	Low	D	1.0	1,602	5.20%
		F	0.0	878	2.80%
		Subtotal		2,480	8.00%
Grades in Question					
		W - Withdrawal	N/A	2,827	9.10%
		WU - Unofficial Withdrawal	0.0	1,743	5.60%
		I - Incomplete	N/A	1,406	4.50%
		Subtotal		5,976	19.30%
Non-Judgemental Grades*			N/A	920	N/A
		Total		31,916	

* Including grades assigned to auditor, administrative withdrawal, etc.

Table 2. T-Test of Numbered Grades of "A" to "F"

Variable	Count	Mean	Standard Deviation	Mean Difference	F*
Part-Time	13,434	2.943	0.979		
Full-Time	11,586	2.836	1.018	0.107	34.478**
Senior	6,882	2.836	1.005		
Junior	4,704	2.838	1.037	-0.002	0.537
H&SS	15,016	2.930	0.976		
S&T	9,102	2.817	1.055	0.113	105.727**

* Levene's Test for Equality of Variance. ** p=.000.

Table 3. Chi-Square Tests of Grading Groups

	Grading Group							
	High	Medium	Low	W	WU	I	Total	Chi-Sq*
Part-Time	52.1%	22.5%	7.4%	8.1%	6.0%	3.8%	16,366	
Full-Time	46.7%	23.8%	8.6%	10.3%	5.2%	5.4%	14,630	159.29**
Senior	45.8%	24.3%	8.3%	10.7%	5.3%	5.5%	8,773	
Junior	48.1%	23.1%	9.1%	9.6%	4.9%	5.2%	5,857	15.23
H&SS	51.0%	23.0%	7.4%	7.4%	6.0%	5.2%	18,462	
S&T	46.8%	23.3%	9.6%	12.2%	5.1%	3.1%	11,426	328.308**
Lower	46.3%	24.5%	8.9%	10.0%	6.3%	4.0%	25,934	
Upper	62.9%	18.7%	4.0%	5.2%	2.6%	6.6%	4,248	592.083**

* p<.01.
DF=5.
**

Disciplinary Difference. Academic disciplines or departments at the College are organized in two broad divisions: the Division of Humanities and Social Sciences (H&SS) and the Division of Science and Technology (S&T). In Fall 1997, 19,069 grading events took place in the Division of H&SS and 11,649 in S&T. The T-Test in Table 2 points to the fact that, measured by mean quality points per credit, student average grades were 0.113 point higher from the courses in the Division of H&SS than those in S&T. Table 3 shows that the H&SS Division was responsible for 51.0% of the high grades awarded, whereas S&T, 46.8%. On the other hand, H&SS's low grades accounted for 7.4% of the total, while S&T's accounted for 9.6%. The results show that grades are higher in the humanities and social sciences than in science and technology disciplines.

It is interesting that, while the faculty in the H&SS Division gave more unofficial withdrawals (WU's) and incomplete grades (I's) than S&T faculty did (6.0% vs.5.1% and 5.2% vs. 3.1%, respectively), the latter received far more W's from the students (7.4% vs. 12.2%). It seems that, though S&T faculty is less likely to "inflate" grades, it might be of greater concern in terms of a need for pedagogical improvements to help students overcome the difficulties.

Course Levels. Given the fact that the College's academic offerings range from associate degree programs all the way to the Masters, the frequencies of grades/grading events by course level are pyramidal: the higher the course level, the fewer the students/grades. Table 4 displays an unambiguous pattern: the higher the course level, the higher the average grades.

With undergraduate courses selected, a chi-square test was performed and the result (see Table 3) confirms a significant grading difference between lower level courses (100- and 200-levels) and upper level courses (300- and 400-levels; 500-level courses are excluded for a more rigorous test). Upper level instructors gave out 62.9% high grades, as opposed to the lower level, 46.3%. Meanwhile, upper level instructors gave less than one-half of low grades as compared with lower level instructors (4.0% vs. 8.9%). What is especially intriguing is that while upper level instructors seemed to be more prepared to award incomplete grades (6.6% vs. 4.0%), they assigned or received by far the fewer WU's and W's (5.2% vs. 10.0% and 2.6% vs. 6.3%, respectively). This suggests an important difference between incompletes and withdrawals.

Table 4. Mean and Standard Deviation of Numbered Grades of "A" to "F"

Course Level	Count	Mean	Standard Deviation
100-Level	3,652	2.736	1.076
200-Level	7,025	3.006	0.879
300-Level	2,658	3.125	0.856
400-Level	979	3.188	0.798
500-Level*	125	3.689	0.498
600-Level	480	3.469	0.584
700-Level	84	3.607	0.560
800-Level	17	3.706	0.588
Total	25,020	2.894	0.999

* Including independent study, internship, and special topics.

Elaboration

Table 3 suggests that full-time and part-time faculty graded differently while there was no significant difference between senior and junior faculty. These two findings were further tested under more controlled conditions to make sure that the differences found are not spurious. The logic is that if the said differences disappear or weaken after controlling for the other variables, then the differences may be to some degree spurious. If the differences stay unchanged after controlling for the other variables, then they are probably true or nonspurious (Chen, 1998).

For the categorical data presented in Table 3, statistical control was carried out via a partial- or sub-table approach. Tables 5 and 6 present the results of the elaboration. A consistent pattern of full-/part-timer difference in grading practices controlling for disciplinary difference and course levels suggests that the results of the bivariate analysis presented earlier are probably true (i.e., nonspurious). However, the conclusion regarding the difference between senior and junior faculty in grading practice can be partly attributed to the disciplinary difference because the finding is reversed for grades awarded in the H&SS lower level and S&T upper level courses. That is, senior faculty teaching lower level H&SS courses tended to award slightly more higher grades than their junior counterparts, while junior faculty teaching S&T upper level courses tended to do the same than their senior counterparts.

Multivariate Analysis

A regression procedure was conducted to provide a comprehensive understanding through multivariate analysis (Table 7). The results reconfirmed the influences of course level and disciplinary differences on faculty grading, and course level had a greater impact than disciplinary difference. Adjunct faculty graded higher on average than full-time faculty, whereas junior faculty do not seem to have graded higher than their peers in senior ranks.

Table 5. Grade by Faculty Full-/Part-Time Status Controlling for Course Level and Discipline

Course			Faculty Status		
Level	Discipline	Grade	Part Time	Full-Time	Chi-Square
Lower	S&T	High	60%	51%	
		Medium	30%	32%	
		Low	10%	17%	82.967*
	H&SS	High	62%	55%	
		Medium	28%	34%	
		Low	10%	11%	59.220*
Upper	S&T	High	77%	66%	
		Medium	19%	25%	
		Low	4%	8%	17.306*
	H&SS	High	84%	70%	
		Medium	15%	26%	
		Low	1%	5%	61.388*

* p<.01.

Table 6. Grade by Faculty Junior/Senior Status Controlling for Course Level and Discipline

Course Level	Discipline	Grade	Faculty Status Junior	Faculty Status Senior	Chi-Square
Lower	S&T	High	53%	50%	
		Medium	31%	33%	
		Low	16%	17%	2.221
	H&SS	High	53%	57%	
		Medium	34%	34%	
		Low	13%	10%	21.850*
Upper	S&T	High	75%	62%	
		Medium	15%	30%	
		Low	9%	8%	26.841*
	H&SS	High	70%	69%	
		Medium	24%	27%	
		Low	6%	4%	2.503

P<.01.

Table 7. Multiple Regression Results on Numbered Grades of "A" to "F"

	Beta	*t*	Coding Scheme
Course Level	0.173	26.527 *	1=100-level, 4=400-level, 5=graduate
Adjunct	0.084	11.246 *	1=adjunct; 0=not adjunct
Division	0.038	5.938*	1=H&SS; 0=S&T
Junior	- 0.014	-1.928	1=junior faculty; 0=not junior
R^2	0.034		

* p<.05.

DISCUSSION

College administrators often find themselves caught in a dilemma when their college is being accused of grade inflation, especially when "hard" data over time seem to support the accusation. On the one hand, since grading is always a faculty prerogative, the administration is supposed not just to refrain from interfering faculty grading practice but to defend this basic academic freedom. On the other hand, institutions, especially the public ones, are increasingly held accountable for their performance and outcomes, and nothing serves as a more negative indication of a college's lack of academic standards than grade inflation. Therefore, to college administrators, this is not a matter of whether to intervene with faculty grading practices or not; it's a matter of how.

Past research has shown that to simply compile data or to go after the trend of change in grading patterns over time, as most researchers have done so far, does not help solve the problem at all. It is our belief that the judgment of whether there is grade inflation is more of a normative or political issue rather than an academic or scientific one. In other words, it is the lack of unified or standardized criteria in classroom grading that makes it impossible to speak about grade inflation in any absolute terms. Therefore, in the last analysis, to understand the potential factors contributing to the variation in grade distribution becomes a prerequisite for any effective policy intervention, currently represented by a desire to keep grades in check or to achieve grade deflation (Agnew, 1993).

The findings of this article suggest that greater attention should be paid to upper level courses, courses offered in the humanities and the social sciences, and part-time faculty grading practices. Faculty rank is generally not a concern, though senior faculty teaching lower level courses in H&SS and junior faculty teaching upper level S&T courses tended to grade higher. This is the approach that identifies possible problem areas without confirming or dismissing the accusation. The results provide administrators with very specific and in-depth knowledge about faculty grading practices at the college. A study of this nature is to guide college administrators in making policies that target specific areas of problem without having to come up with any sweeping changes that may hurt the innocent.

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DESIGNING GRADUATE ADMISSION STUDIES TO INFLUENCE CAMPUS TRANSFORMATION

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Introduction

Purpose. This paper presents the rationale, methodology and selected results from a study which examined the enrollment decision processes of students accepted to a newly redesigned, two-year Master of Business Administration (MBA) Program. The immediate purpose of this study was to acquire an in-depth understanding of the motivation and enrollment decision processes of accepted students; to obtain information about the School's image among these students; and to identify the School's competitive position in the marketplace. The ultimate purpose was to use this information to design program modifications and craft recruitment strategies that would successfully attract the optimum number of high quality students.

Program Description. This study was sponsored by and conducted for the F.W. Olin Graduate School of Business at Babson College. The Olin Graduate School is committed to being an internationally recognized leader in graduate management education. To achieve this goal, the school recently created and implemented an innovative curriculum designed to prepare graduates for entrepreneurial leadership in a changing environment. Reflecting this theme, the curriculum focuses on the following learning outcome areas: team-based learning; pragmatic thinking; a cross-functional perspective; a business-wide perspective; persuasive communication; and a global opportunity orientation. Field-based learning is a vital and defining characteristic of this curriculum.

Review of the Literature. Three streams of literature provide a theoretical background and research base for the present study: first, the extensive body of research examining undergraduate students' college choice process; second, research on graduate students' enrollment decision process; and third, specific studies focused on the enrollment decision process of graduate business students.

Undergraduate College Choice Studies. At the undergraduate level, Chapman (1981) identified structural and attribute variables, such as demographic characteristics, college characteristics and financial aid needed as predictors of college choice. Hossler and Gallagher (1987) proposed a three stage model of college choice: a predisposition stage, a search phase; and a final selection stage. In terms of specific variables, research from the 1960's to the present has consistently established the effect of family income on students' college choice (Baird, 1967; Flint, 1992); Hearn, 1984, 1988; Zemsky & Oedel, 1983). Several undergraduate level studies have also discovered strong relationships between students' ability and the college choice process. These studies consistently revealed that high ability students attribute primary importance to academic factors (Fink, 1997; Galotti & Mark, 1994; Wanat & Bowles, 1992).

Undergraduate college choice studies have also established the relationship between students' perception of institutional characteristics and their college choice. Examples include the quality of staff/faculty, types of degree programs, faculty student interaction, and financial assistance (Coccari & Javalgi, 1995); good academic reputation, good job placement, and well managed facilities (Comm & LaBay, 1996); and career preparation, distance from home, the quality of the school's research program, and library resources (Martin's, 1996). Also on the perceptual level, Terkla and Pagano (1993) demonstrated the relevance of the institution's image to students' enrollment decision.

Graduate School Admission Studies. Kallio (1995) reports that graduate student decisions are affected by some of the same factors influencing undergraduate students: the academic reputation of the institution; program quality and size; price; financial aid; geographic location; contact with faculty; and individual student characteristics, such as academic ability and achievement. Graduate students appear to differ from undergraduates in terms of a greater influence of spouse, family and work considerations. Olson and King (1985) offer a preliminary model of graduate students' college choice that specifies three major factors influencing initial consideration of a graduate school - geographic location, personal contact with the faculty; and the reputation of the department, and three additional factors as determinants of the final decision: a positive interaction with university personnel, personal reasons, and previous undergraduate attendance. In an earlier study of over 1,000 new graduate students, Malaney (1987) found that students pursued graduate education more frequently to fulfill their desire to learn more and to achieve personal satisfaction rather than to accomplish job related goals.

Business School Admission Studies. Research on the choice process of business and management students is most pertinent to the present study. Stolzenberg and Giarrusso (1987) reported that career entry or mobility was the most frequently reported reason for pursuing an MBA. However, respondents at schools with highly competitive admission processes were more likely than others to emphasize the development of management skills and business knowledge as their primary reason for pursuing the MBA degree. McClain, Vance and Wood (1984) found that investment of the school's resources, in terms of time and financial aid resources, had the most significant positive effect on students' final choice of a graduate business school. Webb's (1992) research, with approximately 1500 graduate business students, identified academic reputation and accreditation as the two most important fixed college characteristics; the availability of evening classes and the quality of the program as the two most important program characteristics; and the potential marketability of the degree as the only marketing factor perceived to influence business students' college choice decisions.

Methodology

Data Collection. Data for this study were collected by means of a mailed survey designed by the author in collaboration with the Graduate School Dean and Director of Graduate Admissions. The survey was administered to 334 students accepted for the fall 1997 two-year MBA Program. A response rate of 71 percent was achieved, 94 percent for enrolling students and 55 percent for non-enrolling students.

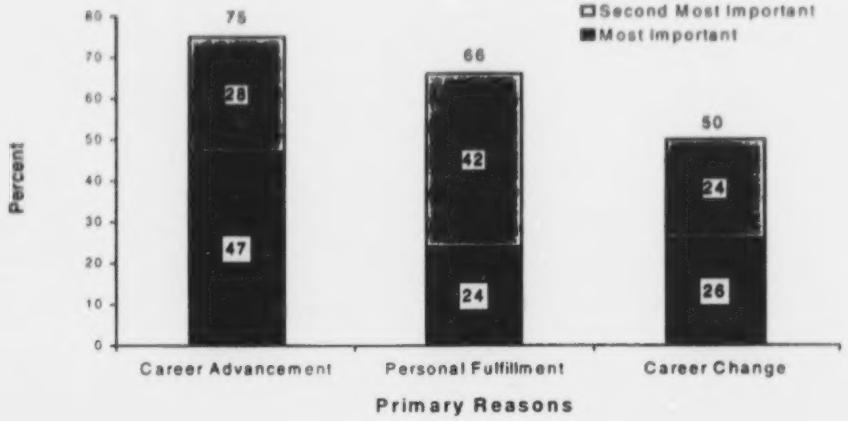
Description of the Sample The respondent group included 238 accepted students; 55 percent enrolled and 45 percent did not enroll at our school. In terms of demographic characteristics, 67 percent, were male and 63 percent were single. The mean age was 28. Close to 40 percent reported annual incomes between $20,000 and $40,000 and 30 percent reported incomes ranging from $40,000 to $60,000. The majority of these accepted students had some work experience prior to applying for an MBA program. These students are academically superior; 70 percent earned scores of 600 or higher on the Graduate Management Admission Test (GMAT).

Results

Reasons for Pursuing an MBA. As shown in Figure 1, results from this research identify three primary reasons motivating students' decisions to pursue an MBA degree. Some75 percent identify career advancement as their most or second most important reason for pursing an MBA degree. Another 66 percent report personal fulfillment as their most or second most important reason, and 50 percent of the accepted student population cite career change as their primary or secondary reason for pursuing an MBA.

Results presented in Figure 1 bear implications both for recruitment strategies and curriculum development. Since these data reflect students' primary motivation for

Figure 1
Most Important Reasons for Pursuing an MBA



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pursuing an MBA, further research might investigate what knowledge and skills are required for students to achieve career advancement; in what ways students are seeking personal fulfillment through the MBA Program and what are the typical career changes prospective students are seeking to achieve. Information on these issues would be extremely useful in guiding program revisions to support students' goals.

Importance of Graduate School Characteristics. Since the characteristics of graduate schools also influence students' choice, survey respondents were asked to rate the importance of 17 graduate school characteristics in relation to their choice. Results revealed that the institution's academic reputation, the quality of teaching and the value of the degree from the school hold a very high level of importance in students' choice of a graduate school; 92, 87, and 87 percent respectively rated these characteristics as ' very important '. Next in order, between 50 and 70 percent rated the following five factors as ' very important ': quality of enrolled students, internships opportunities, program structure and requirements, the faculty's reputation and diversity of course offerings. It is interesting to note that the factors which hold the highest level of importance relate to essential aspects of the graduate degree program. In contrast, issues of much less importance to students include on-campus housing, employer tuition reimbursement, job availability and educational plans of spouses; fewer than 10 percent rated these factors as ' very important ' in their choice of a graduate school.

Chi square analyses identified statistically significant differences between enrolling and non-enrolling students on three of the 17 characteristics: size of the school, program structure and requirements, and opportunities for friendship. Some 18 percent of the enrolling students, compared with 8 percent of the non-enrolling students, rated size of the school as ' very important ' to their choice ($X^2 = 6.20$, $p \leq .05$). Also, 68 percent of the enrolling students, compared with 47 percent of the non-enrolling students, rated program structure and requirements as ' very important ' to their choice ($X^2 = 13.02$, $p \leq .001$). Finally, opportunities for friendship appeared to be more important for enrolling students; 42 percent of the enrolling students, compared with only 32 percent of the non-enrolling students, rated this aspect as ' very important ' to their graduate school choice ($X^2 = 5.98$, $p \leq .05$). These results suggest that enrolling students preferred the smaller size of our school to the larger competitor institutions. They also valued the innovative program and the collegial environment as conducive to forming friendships.

Top Competitor Graduate Schools. In addition to understanding the factors that influence students' choice of a graduate school, it is also important to ascertain the graduate schools with which one is competing for the largest number of accepted students. Therefore, accepted students were asked to identify the top five schools to which they applied; where they were accepted; and where they were offered financial aid. The administrative report presented two sets of competitors. The first, top application competitor set specified the ten graduate schools with which our school shared the largest number of applications. The second, top alternative choice competitor set identified the graduate schools most frequently chosen by the non-enrolling students and the schools reported by the enrolling students as their top alternative choice to our school.

Further analyses included rankings of these top competitors by number of applications or choices among all accepted students as well as among enrolling and non-enrolling students. The top alternative choice schools were also classified in two subgroups: those with which we yielded more than 50 percent of accepted students and those with which we yielded less than or equal to 50 percent of accepted students. Subsequent analyses were conducted to determine how our school differed from these sets of competitor institutions in terms of accepted students' evaluation of the admission process and their ratings of various enrollment decision factors.

Evaluation of the Admission Process. Survey respondents were asked to evaluate several sources of information and experiences encountered during the admission process both at our school and at alternative choice graduate schools. Aspects of the admission process specified include publications, organized admission activities, and contact with significant individuals, such as students and faculty. Table 1 identifies the admission experiences with significantly different ratings for our school compared with alternative choice graduate schools. These are the second choice schools for our enrolling students and the schools at which non-enrolling students matriculated.

Table 1. Significant Differences Between Accepted Students' Ratings of Admission Experiences at Our Graduate School and Alternative Choice Graduate Schools

	Mean Ratings			
Admission Experience	**F.W. Olin**	**Alt. Choice**	**Mean Diff.**	**t Ratio**
Promptness of Reply to Requests	3.46	3.11	0.35	3.51***
Individual Attention	3.51	3.19	0.32	3.33***
Telephone Contact with Admissions	3.42	3.14	0.28	2.76**
Correspondence with Admissions	3.51	3.23	0.28	3.07**
Visit to Campus	3.55	3.34	0.21	2.00*
Graduate School Guide Ratings	3.35	3.52	-0.17	-2.29*
Financial Aid Communication	2.81	3.18	-0.37	-2.29*

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$

As illustrated in Table 1, the mean ratings are higher for our graduate school on five of the seven admission experiences. These superior ratings reflect a high level of satisfaction with promptness of reply to requests, individual attention, correspondence and telephone contact with the admission office, and the visit to campus. In contrast, the two admission experiences with superior ratings for the alternative choice schools are graduate school guide ratings and financial aid communication.

Influence of Enrollment Decision Factors. Survey respondents were asked to rate our school and their alternative choice school on several enrollment decision factors that students typically consider in their choice of a graduate school. These factors included academic issues, such as academic reputation and access to faculty; financial factors concerning tuition and expected cost after financial aid; social factors relating to social activities, and the quality and diversity of the student body; and personal considerations regarding distance from home and spouse's preference. Results from t test analyses identified statistically significant differences between accepted students' ratings of enrollment decision factors for our school and alternative choice graduate schools on 13 of 27 factors. Seven of these differences involve superior mean ratings for our school.

Table 2. Significant Differences between Accepted Students' Ratings of Enrollment Decision Factors for Our School and Alternative Choice Schools

	Mean Rating			
Enrollment Decision Factor	**F.W.Olin Grad. School**	**Alternative Choice**	**Mean Difference**	**t Ratio**
International Study Programs	3.45	2.64	.81	7.20***
Field-Based Programs	3.45	2.74	.71	6.69***
Program Structure/Requirements	3.37	2.91	.46	5.06***
Team-Based Learning	3.44	3.04	.40	4.58***
Access to Faculty	3.40	3.06	.34	3.73***
Class Size	3.11	2.83	.28	3.39***
Specific Academic Programs	3.37	3.12	.25	2.64**

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$

These data reflect a very high regard for our graduate program. All of the statistically significant, superior mean ratings refer to characteristics of the program including international study programs, field-based programs and the program structure and requirements. In contrast, all of the significantly higher mean ratings for the alternative choice graduate schools involved non-academic, programmatic issues.

Enrollment Decision Scales. Table 3 presents the names, components and reliability coefficients for four enrollment decision scales. A student's score on these scales is based on his or her mean response on the component items. As reflected in the reliability coefficients, the internal consistency for three of the scales are moderately strong.

Table 3. Description of the Enrollment Decision Scales

Program Characteristics (r = .76)*
- Program Structure/ Requirements
- Area of Specialization
- Field-Based Programs
- Specific Academic Programs

Career Network (r = .77)
- Alumni Network
- Post-Graduate Employment
- Quality of the Student Body

Academic Quality (r = .78)
- Academic Reputation
- Graduate School Faculty
- Graduate School Ranking
- Teaching Reputation

Diversity/International Programs (r = .62)
- Diversity of the Student Body
- International Study Programs

* r = Chronbach alpha reliability coefficient

Predicting Students' Choice for the F.W. Olin Graduate School

Discriminant analysis was employed to determine which combination of variables would predict accepted students'enrollment decision. Results from bivariate analyses were used to select potential predictors for the discriminant analysis. Variables examined included demographic characteristics; educational background; financial aid status; students' ratings on the importance of various graduate school characteristics; and their ratings of our school on admission experiences and on several enrollment decision factors.

Table 4 displays the discriminant function coefficients, or relative weights, for variables found to be significant predictors of students' enrollment decision. As shown, the strongest predictor is students' rating on program characteristics followed by student diversity and international programs, career network, graduate school guide ratings and academic quality. Students were significantly more likely to enroll at our school to the extent that they rated our school positively on these factors. The discriminant function including these five variables accurately predicted the enrollment decision of 77 percent of the respondents. The canonical correlation of .47 indicates that this function explains 22 percent of the variance in accepted students' decision whether or not to enroll at out graduate school.

Table 4. Discriminant Analysis Results: Predicting Students' Enrollment Decision

Predictors	Standardized Discriminant Function Coefficients	% Correctly Classified
Program Characteristics	.51	77%
Student Diversity & International Program	.38	
Career Network	.28	
Graduate School Guide Ratings	.21	
Academic Quality of the Program	.13	
Canonical Correlation	.47	

$X^2 = 48.09$; $df = 5$; $p \leq .001$

Discussion

Dissemination and Utilization of the Research Findings

Dissemination of the results from this research included a preliminary presentation of the findings to the Graduate School Dean and the Graduate Advisory Board followed by a complete report to the President, the President's Cabinet, the Graduate School Dean, and the Graduate Admission Director. In addition, an executive summary was distributed to members of the Graduate Advisory Board which consists of 24 high-level executives selected for their exceptional stature in the business community and their commitment to the College. Following the distribution of the reports, the author made presentations and engaged in discussions withthe Graduate School Dean, the Graduate Admission Director and staff, the Director of Career Services, and members of the Graduate Advisory Board.

Impact of the Study

Communication from the Graduate School Dean and the Director of Graduate Admissions verified that the results of the study were used not only to validate and enhance the recognized strengths of the Graduate School, but also to implement recommended changes for program improvement. As a result of the study, the Graduate School continued to make a strong personal investment in the admission program emphasizing individual attention, visits to campus, and the involvement of the Dean at information sessions. Recruitment strategies also continued to highlight the strengths of the program with its unique interdisciplinary, team-based and field-based learning experiences and opportunities for participation in a dynamic international program. Further, as a result of the study, the Graduate School developed strategies to improve financial aid communication and the MBA Admission Forum; to increase guidebook ratings; and to intensify the focus on career services. Finally, according to the Dean, the study strengthened the administration's position relative to the design of career paths within the academic program.

Relationship to Previous Research

Reasons for Pursing Graduate Study. Findings from this study confirm previous research results regarding the reasons business students pursue graduate education, but they differ somewhat from conclusions about graduate students in general. The vast majority of respondents in this study, 75 percent, reported career advancement as their most or second most important reason for pursuing an MBA degree. Another 66 percent identified personal fulfillment and 50 percent cited career change as their primary or secondary reason for pursuing an MBA degree. Business students' focus on careers in consistent with the research of Stolzenberg and Giarrusso (1987) who reported that career entry or mobility was the most frequently reported reason for pursuing an MBA. In contrast, Malaney (1987), who studied a group of new graduate students, found the desire to learn more as the most frequently reported reason for pursing graduate study, followed by the desire to achieve personal satisfaction.

Reasons for Institutional Choice. Data from this study revealed that the most important factors in students' choice of a graduate school were academic reputation, quality of teaching and value of the degree from this school. Similarly, Webb's (1992) research with approximately 1500 graduate business students identified academic reputation as one of two most important fixed college characteristics and the potential marketability of the degree as the only marketing factor perceived to influence business students' college choice decisions.

Evaluation of the Admission Experience. Respondents' evaluation of their admission experience reflected a very high regard for the personal and professional services offered by the graduate admission team. Their ratings and comments emphasized the importance of individual attention, promptness of reply to requests, communication with the admissions staff, as well as visit to campus and contact with enrolled students. In an earlier study, McClain, Vance and Wood (1984) also found that investment of the school's resources, in terms of time as well as financial aid resources had the most significant positive effect on students' final choice of a graduate business school.

Enrollment Decision Factors. Clearly, the strongest determinant of our students' decision to enroll was their positive evaluation of the program. Similarly, Kallio (1985), Olson and King (1985), and Webb (1992) also found that program quality or reputation of the department was a significant influence on students' decision to choose a particular institution. Finally, the discriminant analysis model produced from this research highlights several variables found to be significant predictors of students' enrollment decision in previous research. Examples include students' evaluation of the program; perceived opportunities from a career network; and the value of the school's degreel.

Conclusion. This paper illustrates how a graduate admission research study was used to evaluate the impact of an innovative graduate degree program and the effectiveness of admission strategies in recruiting students to this program. Results from this study were used to inform the development of strategic, policy relevant recommendations designed to increase the recruitment of high quality students; to enhance the effectiveness and relevance of the graduate degree program; and to further strengthen the School's national and international reputation.

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USING MICROSOFT ACCESS TO FACILITATE THE SAMPLING AND DISTRIBUTION OF AN ALUMNI SURVEY

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INTRODUCTION

As part of a national grant awarded to the University that will document the effects of the baccalaureate research experience, researchers in the Office of Institutional Research & Planning were asked to coordinate an alumni survey. The primary purpose of the survey was to document alumni attitudes about the academic, personal, and career skills gained from the undergraduate experience. Specifically, we sought to obtain a matched sample of alumni, half of whom were involved in one or more research experiences as an undergraduate, and the other half who were not. To provide a more accurate comparison of research verses non-research students, we wanted to match the two groups on graduation year, undergraduate major, and academic performance, based on class rank within their major and GPA.

HOW TO ACHIEVE THE RESPONDENT SAMPLE

Once we received Human Subjects approval for distribution of the survey, we discussed how to select the sample. Typically, name and addresses of alumni are provided by the Office of Alumni Relations. Because this survey project required a matched sample, substantial thought was invested in how our staff could best obtain the sample. After looking at various options, we decided that the easiest, most efficient method was to manually select from the data file names for the matched group instead of trying to write a program in Natural, SPSS, or SAS. Access was chosen for the database management tool because of its ability to easily manipulate tables, create reports, produce high quality mailing labels, track the return of surveys, and interact directly with other programs, such as Excel.

Table 1 lists the steps and fields used in Access to achieve the respondent sample:

Table 1

Access Object	Object Name & Columns	Description
Table	***all_alums*** • ID/ssn (🔑) • name • degree • college • major • concentration • 2nd major • year • rank • gpa	Import listing of all 1982 - present undergraduate degree recipients from SIS+ located on the University's mainframe. Data Source: MVS dataset
Table	***ugr_alums*** • ID/ssn (🔑) • name • major • year • ugr_alum (1=ugr)	Import listing of Undergraduate Research participants from Office of Undergraduate Research. Data Source: Excel table
Query Type: make table	combine ugr with all alums	Creates *[ugr&alum_combined]* table; Merges *[All_alums]* and *[ugr_alums]* tables by *ID/ssn* for manual matching process.
Table	ugr&alums_combined • ID/ssn (🔑) • name • all_alums_year • college • all_alums_major • concentration • gpa • rank • ugr_alums_year • ugr_alums_major • ugr_alum • sort_key	Manually update *[ugr&alum_combined]* table per matching criteria. Table is sorted by *[ugr&alum_combined].[sort-key]* field. *[ugr&alum_combined].[ugr_alum]:* '1' = Undergraduate Research Alumni '2'= Matched Alumni (manual update) ' ' = Not selected for survey Data Source: Make Table Query
Query Type: make table	ugr and alum selection	Creates *[matched_alumni]* table; Select '1's and '2's from *[ugr&alums_combined]* table.
Table	matched_alumni • ID/ssn (🔑) • name • ugr_alum • all_alums_year • college • all_alums_major • concentration • gpa	Final listing of survey respondents. Includes 856 undergraduate research ('1') alumni and 1,675 non-research alumni ('2'). Use to link to *[address]* file. Data Source: Make Table Query

MAILING LABELS AND MANAGEMENT REPORTS

Creating labels and reports within Access is simplified with the use of the report wizards. Table 2 lists the steps and fields used in Access to produce mailing labels and various management reports:

Table 2

Access Object	Object Name & Columns	Description
Query Type: Select	ID listing for Alumni office	Select ID and name from *[matched_alumni]* and save as an Excel file *[ID_listing_for_alum_office]* to export to the Alumni Office in an e-mail attachment.
Table	***address*** • ID/ssn (🔑) • name • street1 • street2 • city • state • zip	The Alumni Office provided an Excel spreadsheet listing current addresses based on the file sent, excluding those that are deceased or do not wish to be contacted (n=87). Data Source: Excel table
Query Type: Select Report	Matched Alumni Matched Alumni	Create an inner join between *[address]* and *[ugr&alum_combined]* tables by *ID/ssn* for the Matched Alumni Report. The report lists the results of the matching process by year and major. Includes average GPA for each major within the each year. Data Source: Select Query
Query Type: Select Report	Matched Alumni Participants List	Use the same query as for the matching report. Lists all alumni participants who receive a survey. Includes alumni group, graduation year, and major. Data Source: Select Query

Query Type: Select	Labels – First Mailing	Create outer joins between *[matched_alumni]* and *[address]* and between *[matched_alumni]*and *[majors]* tables for inside and outside mailing labels. Labels are produced using the Trim function. Trim displays the value of the address control , removing any leading or trailing spaces. (n=2444) •Inside label includes: •ID •Name •Graduation Year •Major (de-coded) •UGR-Alum code ('1' or '2') •Outside label includes: •Name •Street 1 •Street 2 •City •State •Zip code Data Source: Select Query
Report Type: Labels	Inside Label – First Mailing	
Report Type: Labels	Outside Label – First Mailing	

FOLLOW-UP AND SECOND MAILING

As the surveys were returned, we kept track of the completed surveys as well as surveys returned due to incorrect addresses. Because our office staff in not networked for file sharing, these lists were maintained in Excel spreadsheets that were linked to the Access database. With only a 23% (542/2400) return rate on the initial survey, preparations for a second mailing began. A second copy of the survey was mailed to all non-respondents, excluding those for which we had an incorrect address.

The table below lists the steps and fields used in Access to produce mailing labels for the second mailing:

Table 3

Access Object	Object Name & Columns	Description
Table Type: Link Table	***Completed surveys – first mailing*** • ID/ssn (🔑)	Create link to Excel file *[Completed surveys – first mailing]* to exclude names from the second mailing list.
Table Type: Link Table	***Incorrect addresses*** • ID/ssn (🔑)	Create link to Excel file [*Incorrect addresses]* to exclude names from the second mailing list. Also exported the list of names to the Alumni Office in an e-mail attachment for them to update their records. Data Source: Excel table
Query Type: Select Report Type: Labels	Labels – Second Mailing Labels – Second Mailing	Join [*Labels-First Mailing]* query with *[completed surveys – first mailing]* and *[incorrect addresses]* linked tables by *ID/ssn* for inside and outside mailing labels. To exclude the names from the linked files, the query uses 'Is Null' criteria for both *[completed surveys – first mailing]![ID/ssn]* and *[incorrect addresses]![ID/ssn]* fields. • Labels are produced using the same method used for the first mailing. For consistency and as a short cut, use the reports from the first mailing to create the second mailing reports. First change the name of the control source on the report properties then use the Save As option with the new names. Data Source: Select Query

A total of 1,858 surveys were mailed in the follow-up. To date, 1,015 completed surveys were returned, for a total return rate of 45%.

OBSTACLES

As with any project, below is our list of 'obstacles encountered' that challenged us as we progressed through the project. Many of these obstacles caused time delays in mailing the surveys.

- Missing key field
  To get the most current addresses, we sent the Alumni Office separate lists of ID/ssn numbers; one of all the research alumni and one of only the non-research alumni. The initial address files returned from the Alumni Office did not include the ID/ssn field that was needed to link the address files to the other tables within Access. To rectify, we asked the Alumni Office to recreate the files and include the ID/ssn field.

- Incorrect field format
  Our second request for the data from the Alumni Office included the ID/ssn field, however the field was formatted as a numeric field rather than text. This required an additional step of manually typing the leading zeros in student IDs where needed.

- Records incorrectly sorted for labels
  We ran into a problem with sorting the records for the inside and outside labels. The two sets of labels were to be sorted in the same order to simplify the process of collating the surveys. To adhere to bulk mailing policies, the surveys had to be in zip code order. Within Access, the Zip code field was re-coded to a 5 digit zip code for the outside labels, creating a second zip code field. As a result, the inside and outside labels were inadvertently sorted using different keys. We could have reprinted the labels, but chose to sort them manually. This was a tedious and time-consuming process.

The time delays became a problem because the surveys had already been dated and printed. Next time, we will ensure that the labels are ready to go prior to printing. Despite the obstacles, we are pleased with the outcomes of this project. The use of MS Access greatly aided our matching procedure, keeping track of respondents and non-respondents, and acquisition of mailing labels.

THE RELATIONSHIP BETWEEN STUDENT SUCCESS IN COLLEGE AND ASSESSMENT FOR REMEDIAL ASSISTANCE

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INTRODUCTION[1]

National and state studies show that many students continue to enter college unprepared for college-level work. According to the U.S. Department of Education, 78 percent of higher education institutions that enrolled college freshmen in 1995 offered at least one remedial reading, writing, or mathematics course. In Maryland, all community colleges offer some form of remedial instruction. Ten of the State's 13 public four-year campuses also offer remedial programs, although two provide it in math only. A study conducted by the Maryland Higher Education Commission (May 1996) revealed that 47 percent of all new students at Maryland public campuses who enrolled directly from high school needed some form of remediation.

Although the level of remediation is disconcerting, the problem of academically underprepared students is not a recent phenomenon. In 1828, an article in the Yale Report admonished the college for admitting students with "defective preparation" (Maryland Higher Education Commission, 1996). In 1907, more than half of the students enrolling at Harvard, Princeton, and Columbia failed to meet entrance requirements and these schools established remedial programs (Payne and Lyman, 1996). By the mid part of the 1900s, most colleges and universities had established college preparatory programs to assist academically underprepared students (Maryland Higher Education Commission, 1996). Today, 90 percent of all public colleges and universities offer at least one remedial course (National Center for Education Statistics, 1998).

Despite its history on college campuses, remedial education remains a controversial component of American higher education. Many academicians, trustees, legislators and average citizens question the need for providing courses on material that should have been covered in secondary school. Furthermore, the effectiveness of remedial programs is of particular concern to policy makers, educational administrators and faculty.

However, most states do not know whether college-level remedial programs have been successful. A few have collected information about the completion rates of students in remedial classes, the subsequent performance of remedial students in regular college-level classes, and the short-term retention rates of remedial students. But there has been only limited investigation of the long-term success patterns of these students. The purpose of this paper is to explore these questions: What are the success rates (graduation and transfer) of students assessed for remediation at Maryland community colleges? What are the graduation rates of students assessed for remediation at Maryland public four-year campuses? Are there differences between the success rates of students based on the amount of remediation for which they were assessed? How do these rates compare to those of students who did not require remediation?

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[1] Tables referenced in this article can be obtained by contacting the authors.

PREVIOUS STUDIES

Retention is problematic among students who are academically underprepared (Umoh, Eddy, and Spaulding, 1994; Schoenecker, Bollman and Evens, 1998). Studies that have been done on the effectiveness of remedial programs on retention generally support the view that efforts to improve the basic skills of underprepared students can produce meaningful outcomes.

Both statewide and institutional assessments of remedial programs in Minnesota, New Jersey, Texas and Maryland suggest that remedial education has had a positive impact on short-term retention (Boylan and Bonham, 1992; Schoenecker, Bollman, and Evens, 1998; Tedrow and Rust, 1994; Bickford, Clagett, James, and Taibi, 1998). These studies contend that students who completed remediation requirements perform in college at levels generally comparable to those who did not require remediation.

In addition, there has also been some research on the relationship between the extent of remediation and success in college. In Texas, researchers examined the extent that remedial programs prepared skill deficient students for success in college (England, 1994). Tracking the progress of first-time, full-time degree seeking students who entered between the fall of 1991 and the spring of 1994, researchers found that students with skill deficiencies in two or three areas had the lowest levels of success. A study at Prince George's Community College in Maryland also found that the achievement level of students varies by skill deficiency. Students lacking basic skills in two or more areas were less likely to persist, graduate or transfer to a four-year institution (Bickford, Clagett, James, and Taibi, 1998). The authors concluded that students prepared for college are more likely to graduate, transfer or persist from their freshman to sophomore year than students that required remedial assistance.

METHOD

The analysis in this paper was performed by matching unit record data elements from the Maryland Higher Education Commission's Enrollment and Degree Information Systems (EIS and DIS) with those from its High School Graduate System (HGS). HGS collects information about the academic performance of graduates of Maryland high schools in the first year of collegiate study. Included are items dealing with assessment for remediation in math, English and reading. "Remedial" is defined in HGS as a course or series of courses or services designed to remedy deficiencies in preparation for college level work.

EIS and DIS contain specified data elements for each student enrolled at a Maryland college or university and for each student who graduated from such a campus. Each record for the public institutions is identified by a student's social security number, making it possible to examine student persistence, graduation and transfer patterns by matching records among years.

There are several limitations inherent in this study:

1. While HGS collects annualized information (students who enrolled in the summer, fall

and spring), EIS consists of a snapshot of students in attendance at a point of time each fall. For this reason, it is impossible to match the records of EIS with students in HGS who enrolled in other than the fall semester of any particular year. Hence, only students who entered college in the fall are included in this analysis.

2. HGS includes data only about students who entered college directly from high school. Therefore, this study contains no information about remedial assistance provided to other new full-time freshmen.

3. HGS is in its sixth reporting cycle, with 1991-1992 being the earliest year. Therefore, long-term retention and graduation tracking is available for just a few cohorts. Analyses will be performed for additional years as more information is collected.

4. Campus policies regarding remediation and assessment in Maryland vary. Equally underprepared students may be required to take different types of remediation, depending on the institution at which they enroll. HGS collects information about the number of students who were assessed as needing remediation in certain areas, and institutions diverge in terms of whether these individuals actually have to enroll in such classes. In addition, the availability of remedial information differs among the State's colleges and universities. As a result, the definition of "remedial" used in this study is not apt to be applied consistently among institutions at this time. However, this is expected to change in the near future at the State's community colleges. The instructional deans at these institutions have undertaken a project that envisions the implementation of statewide instruments, standards and policies for testing and placing remedial students within two years.

DATA ANALYSIS

New full-time freshmen in the entering classes of 1991, 1992 and 1993 at Maryland community colleges and those matriculating at the State's public four-year campuses in 1991 and 1992 were organized into four categories reflecting the amount of remedial assistance for which they were assessed in college: 1) those who were assessed but needed no remediation, and those who required remediation in 2) either math, English or reading, 3) in two of these areas, or 4) in all of these areas. Using this classification, the following analyses were conducted:

- The percentage of community college students who transferred to a public four-year campus in Maryland and/or earned a certificate or associate degree from any two-year institution in the State within four years of matriculation.
- The percentage of students at public four-year institutions who earned a bachelor's degree from any public campus in the State within five or six years after entry.

Community Colleges

The community college information is particularly pertinent, since the greatest amount of remedial education in Maryland higher education, as elsewhere, is performed at two-year institutions. A substantial number of community college students who entered directly from high school required help in basic skills (table 1). In each year, more than 60 percent of the two-year students needed some kind of remedial assistance, and more than 30 percent required it in two areas or more.

The statistics in table 2 show that, for each of the three cohorts, success (as defined by the percentage of students transferring or graduating within four years) declined as the number of areas in which remediation was needed increased. Adding the percentage of students who remained enrolled at a community college to this "success rate" did not change this pattern. The figures were very consistent across years. With very few exceptions, this trend was not affected by gender and ethnicity (table 3).

Public Four-Year Campuses

Far fewer students at Maryland's public four-year colleges and universities required remedial assistance. More than 80 percent of the new full-time freshmen in 1991 and 1992 were assessed as not needing remediation (table 4).

The findings from the four-year institutions resembled those at the community colleges (table 5). Among students in the class of 1991, those who required no remediation had the highest graduation rate after both five and six years. Students who had been assessed for remedial help in just one area were next highest, while those who needed assistance in two or more areas experienced the lowest graduation rates. When the percentage of students who remained enrolled at their college is added to the graduation rate, students who required help in all three areas have the lowest level of success. The distinction between the remedial categories is even more apparent when one examines the graduation and retention rate of entering students in 1992 five years after matriculation. As with community college students, these findings were consistent in a majority of cases across gender and ethnicity (table 6).

POLICY ISSUES EMERGING FROM THE STUDY

This study documents that recent high school graduates who are academically underprepared are less likely to be successful in college. Furthermore, there is a relationship between the extent of remediation and college success. Students who lack the basic skills in two or more academic areas are less likely to persist or graduate. The following policy issues arise from this study.

Should students who are assessed as needing remediation be required to take it regardless of their course of study?

One of the limitations of this study is that it is unable to distinguish between the performance of students who were assessed for remediation and took it and those who were assessed but did not. However, research suggests that there is a relationship between successful completion of recommended remedial coursework and overall success in college and that remedial programs can have a positive impact on underprepared students. Students who enter college lacking the basic skills needed to perform effectively are already disadvantaged scholastically. These individuals almost certainly will reduce further their chances of success if they do not take remedial coursework in their areas of deficiency. For this reason, it makes sense for college administrators, particularly at open admissions institutions, to require entering students who need remedial assistance to take it as a prerequisite for enrolling in regular courses. To do otherwise would be to provide access to some students with little hope that they will be successful.

Should students who plan to enter postsecondary education at any level be encouraged or even required to take a college preparatory curriculum?

The major finding of this study is that students who enter college needing remediation are less likely to graduate or transfer than those who do not--and that the chances of success decline as the number of areas in which remediation is required increase. The message is clear. Students who enter college underprepared are already facing an uphill struggle, regardless of their intellect, ambition or determination. And while colleges and universities may be able to fix a student's shortcomings in one field with a one- or two-semester class, the problem becomes more severe for students whose academic deficiencies range into multiple areas.

These problems can be largely remedied by the choices that students make in high school. Research by the Southern Regional Education Board and several states have found that rigorous academic preparation in secondary school, and the seriousness with which students apply themselves to their high school studies, affect the level of remediation they need in college. The intensity of curriculum makes a difference. Therefore, efforts should be undertaken to keep secondary school students and their parents informed about the importance of following a recommended course of study in preparing for college and to stress the value of developing and applying good study skills. Indeed, a number of states that have implemented policies that require or encourage students to complete a more challenging college preparatory curriculum have reported a decline in the number who need remedial coursework. In short, policy makers interested in shrinking the remedial empire in higher education need to focus attention on what is happening in the K-12 arena.

Although there is evidence that well-selected courses make a difference, there are students who complete a college preparatory program in high school and are still assessed for remediation in college. This anomaly may be due to the variation in the content of courses taken in specific subject areas. Furthermore, the quality of college preparatory programs differ from school to school and how well students do in college courses are also factors.

Should colleges and universities establish special programs or requirements for students who require extensive amounts of remediation?

The results of this study suggest this is essential if these students are to have any chance of success at all. Accommodating students who show a general lack of preparation for college work requires a more comprehensive set of learning support services and a supportive learning environment (Noel, 1987). Many colleges and universities have developed innovative approaches to improve the success rates of underprepared students. The key attributes of these programs are their ability to integrate students into the campus environment by identifying and placing underprepared students into remedial courses, providing small classes and personalized instruction, and collaborating with other campus support services. Research suggests that colleges able to provide multiple support services can enhance the overall achievement of underprepared students.

What kinds of early intervention programs should be established to reduce the number of recent high school graduates who enter college needing remediation in math, English, and reading?

To raise the level of academic preparedness, early intervention programs must be established and target students as early as middle school. These programs should be designed to educate students and parents about college admissions requirements before students enter high school. Early intervention programs should help them understand the consequences of their decisions and should also encourage students to seriously consider their future choices. Furthermore, middle school students should be encouraged to enroll in a rigorous curriculum in high school that consists of core courses in science, mathematics, English and social studies. These programs should increase the academic ability of students regardless of whether or not they continue their education after high school.

Should colleges and secondary school systems partner to create parental education programs to provide an understanding of the consequences for students who come to college poorly prepared?

Many parents who have not been to college themselves are often intimidated by schools, and they may have an inadequate understanding of the consequences for students who come to college underprepared. Establishing a partnership between college faculty, secondary school teachers and administrators, and parents could help to enhance understanding of the importance of enrolling in a rigorous curriculum in high school as well as increase the amount of out-of-school time that students apply to academic endeavors.

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A FORMULA FOR WRITING ENVIRONMENTAL SCANS FOR COMMUNITY COLLEGES

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Introduction

Community Colleges have a mission substantially more focused than four-year institutions, specifically to serve the local community in providing post secondary education and workforce training. To do this effectively it is necessary for administrators and faculty to keep current on various aspects of the community they serve. Many Offices of Institutional Research, however, shy away from conducting environmental scans because the task seems daunting or the time too limited. Neither needs to be the case.

This paper proposes a five-part formula for conducting an environmental scan and writing up the results. It is designed to make the project as easy as possible, focused, and usable the next time around (once every three years, if possible). Besides making the environmental scan *doable*, the objective of this formula is to provide the data necessary for college faculty and administrators to have a good sense of future student enrollments, and be able to make informed decisions for planning future academic programs, students services, off-campus locations, and other long range objectives.

Part I: Focus the Subject Matter on Five Topics

There are an endless number of topics about the community or county one could address in an environmental scan, but the following seem to be the most important for decision making:

1. **Population Trends**: The first order of business is an analysis of the absolute growth or decline of the county population followed by an analysis of any geographic shifts of the population within the county. Is the population moving out of the cities toward more rural areas; is it moving north or south; is it remaining fairly stable in location? Next, a breakdown of the ethnic background of the population with emphasis on trends. What ethnic groups are growing the fastest? Where? Third, the age trends. Is the population getting older; is the birthrate increasing? Is there a bulge in the 34 to 50 aged population? Last, the gender. Do men and women comprise roughly the same percentage of the population at various ages, or are there marked differences?

2. **Economic Outlook**: A review of the overall economy of the county is the first focus here. What are the prospects for economic growth in the next five years in terms of annual percentage growth rate? Is the county coming out of or going into a recession? Next should come an analysis of the sectors within the economy indicating which ones are growing. The standard sectors used in most government reports include: (1) W*holesale & Retail Trade, (2) Services, (3) Government, (4) Manufacturing, (5) Finance, Insurance & Real Estate (F.I.R.E), (6) Transportation, and (7) Construction.* Included in *Services* are two particularly important sub-sectors--the health care industry and the information technology industry—two probable areas of growth, depending on where you live.

3. **Job Openings**: Projections showing the number of job openings in the next five to ten years is the focus of this section. Select those occupations requiring post-secondary education. The state or county Department of Labor should have the data broken down by the level of higher education required, including, *Occupations Requiring Some Post-Secondary Education, Occupations Requiring an Associate's Degree, and Occupations Requiring a Bachelor's Degree.*

4. **High School Graduates:** Recent high school graduates in the county comprise an age group particularly important to community colleges because they tend to be the largest source of first-time, full-time students. The trend over a period of years is important. Currently, an annual increase in the number of high school graduates is occurring throughout the country as the baby boomlet (children of baby boomers graduating from high school) plays out. This trend should continue until 2008. A comparison of the number of high school graduates per year to the percent entering the community college the following fall semester is a useful bit of information, too.

5. **Commutation and Transportation:** Community colleges also are unique in the degree to which most of the students use some form of vehicular transportation each day. Major road improvements, changed bus routes, and unreliable commuter train schedules can have an impact on college enrollments. This section of the environmental scan should list the major road repairs for the next three years and their completion dates, new or revised bus routes, and chronic commuter rail problems. Of course, adequate parking is a factor not to be overlooked, even if, technically, it is located on campus.

II: Collection of Data

Never has the old adage, A job well begun is a job half done, been more applicable here. Begin with the County Planning Department, and do not just communicate by phone or E-mail. Make an appointment to meet with the top planner that will see you. Take any pertinent handouts and reports that Planning Departments tend to display in racks and open files, and ask to see their maps. The Planning Department is particularly good for population trends and transportation maps. If the county also has an Office of Economic Development, go there, too. This Office usually publishes booklets for perspective companies that are thinking of locating in the county. The booklet will probably include a wealth of information on the local economy.

For job opening trends in the county, the state Department of Labor is probably the best source. Ask for the chief analyst, who should be able to provide projections for the number of job opening per occupation in your region, if not county, further broken down by the amount of education required. Ask only for the jobs requiring (1) some higher education, (2) an associates degrees, and (3) a bachelor's degrees. A separate chart of the number of projected openings for the top ten job categories for each level of higher education is an effective way to present this data.

For information on high school graduates contact either the local association of schools in your county or the state Department of Education. Your own admissions director is a good source for the number of June graduates who enroll the following fall.

For information on transportation developments, the county Transportation Department may be able to add to the information available from the Planning Department, or, if nothing is available, the State Department of Transportation may be helpful. If you are located in a large metropolitan region, there may also be a regional organization.

The most important objective is to develop a working relationship with these planners and officials. To the extent you can quickly call on these people for information in the future, your value to the College increases considerably. It is worth the time to develop personal contacts.

Part III: Use Tables and Charts and Maps

Each major point should be supported either with a map, a table, or a chart. For population shifts within the county and transportation problems, maps are particularly useful. For demographic trends and job sector trends, bar charts and pie charts are very effective. For trends in high school graduation rates, and job opening trends, tables are useful. In fact, tables are useful to back up most types of bar charts and pie charts. Charts, maps, and tables not only provide a quick visual way to present data, but they break up the page and give a nice presentation that can make the difference between someone willing to wade through the report or not.

Part IV: Develop a Detailed, Concise Table of Contents

Having spent all the time to collect and analyze the data, it is well worth the investment of time to develop a detailed and concise Table of Contents. It allows the perspective reader to see quickly where information is located, and immediately displays the organizational layout of the report. Making it a part of the front page, such as the *Reader's Digest*, also can be effective.

Part V: Include an Executive Summary and Conclusion

Some researchers think that by not including an Executive Summary, the reader will be forced to read the entire report. Wrong. More than likely, the reader will not read the report at all. One of the greatest challenges faced today by those in Institutional Research is to get the rest of the College to actually read the reports produced.

Executive summaries are a large part of the answer. Everyone likes to feel they have cut through the superfluous and acquired the nuts and bolts of the report by reading just a few pages. The secret for Institutional Researchers, therefore, is to have the Executive Summary cover everything in shorthand form. A modified outline format lends itself to this task. Begin the summary with a brief statement of what the report covers, i.e., this environmental scan focuses on five factors (1) Population Trends, (2) the Economy, (3) Job Market Trends, (4) High School Graduation Trends, and (5) Commutation Trends.

At the end of each factor that is summarized, it may be appropriate to draw a conclusion or make a recommendation. If so, these statements might best be put in italics, and even bolded to draw attention to them. Too often Institutional Researchers shy away from offering conclusions or making recommendations. Yet, they are the ones that have been working with the data the most. It is time for more Offices of Institutional Research to provide this higher level of service.

Conclusion

Environmental Scans are not difficult to produce, once a specific format is developed and the best sources for the data are identified. Since these scans should be conducted periodically (every three years, if possible), it is well worth the effort, initially, to establish close personal working relationships with planners at the county and state level.

Writing the report is only half the challenge. The other half is to make sure that faculty and administrators read the report and incorporate the information into their decision making in developing new curricula, changes in student services, locations for off-campus sites and other long range plans. In accomplishing this later objective, the importance of maps, charts and graphs to fortify the data should not be underestimated, as well as the effectiveness of a concise and complete Table of Contents and an well-written Executive Summary. As an example, an executive summary for an environmental scan conducted for Westchester Community College follows in Appendix I.*

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* An example of a complete environmental scan report using this format is available on request. It is entitled: ***Sources of Student Enrollments for the Next Decade, A Demographic and Economic Outlook: 1998 to 2008***, by Marcia M. Lee, Ph.D., Office of Institutional Research and Planning, Westchester Community College, Valhalla, New York June 1998.

Appendix I

An Executive Summary Example

Sources of Student Enrollments for the Next Decade

A Demographic and Economic Outlook: 1998-2008

With the population of Westchester county projected to grow only minimally in the next decade, Westchester Community College will have to look *within* the population and *outside* the county to identify potential new students.

This report focuses on five factors, (1) Population Trends, (2) the Economic Outlook (3) Job Market Trends, (4) High School Graduation Trends, and (5) Commutation Trends, to analyze their impact on future student enrollments and to suggest groups within the population the College might seek to attract.

Population Trends: Four major population shifts are projected to occur within the county and in the greater Hudson Valley Region in the coming decade (1998 to 2008).

1. The rapid growth in population in northern Westchester and southern Putnam county is not expected to continue due to the recent implementation of the New York City 1997 watershed regulations that will constrain housing production considerably. ***The College should not look to northern Westchester or Putnam county in the next decade for a rapidly growing population to supply a new source of additional students.***

2. Fortunately, southern Westchester, after decades of population decline is expecting a modest growth caused by in-migration from the Bronx and other metropolitan areas. ***In terms of potential sources of new enrollment the southern section of the county, particularly Yonkers, Mount Vernon, and the northern Bronx are places to look.***

3. The Hispanic population will undergo the largest growth of any ethnic group between the years 2000 and 2010. It is projected to increase by one-third (32.4%) adding 60,667 to the population. ***The potential new growth in the student body will come primarily from students of Hispanic background.***

4. The population of Westchester county will continue to grow older, such that by 2010 almost one-fifth (17.1%) will be 65 and older and less than one fifth (17.1%) will be 19 and under. ***In developing new programs the College should***

give special consideration to courses and programs that appeal to an older generation of people.

High School Graduates: In June, 1997 the baby boomlet (children of the baby boomers graduating from high school) began to *kick in* and the number of high school graduates is expected to gradually increase until 2008. ***High School graduates, therefore, are a growing pool of potential students for the next ten years.***

Economic Outlook: The economic outlook for Westchester and the Hudson Valley Region is favorable with an annual growth rate projected at between 1.2% to 2.2% for at least the next five years. Neighboring counties are expected to have an even higher growth rate with Fairfield, Connecticut projected to grow at an annual rate of 2.6% and northern New Jersey at 2.5%. ***Since many WCC students find employment in these areas outside the county, this should be kept in mind when calculating the job market for a prospective degree or certificate program.***

Job Market Outlook: In the Hudson Valley Region the shift to a service economy will continue, going from 32.9% of the economy in 1996 to 37.3% by 2005. Within this sector the largest number of jobs will occur in the health services industry with 18,400 new jobs projected. The fastest growing area, however, is the business services sector, particularly information systems, with a 52% rate if increase projected, adding 17,200 new jobs by 2005. All the other sectors will see little or no increase including the Government sector and the Finance, Insurance and Real Estate (F.I.R.E.*) sector.* ***In planning new curricula, therefore, the health sector and the information systems sector are expected to far out-distance the others in future job openings in the next decade.***

Jobs Requiring Higher Education: The top ten occupations with the largest number of projected job openings that require some post secondary education, an Associate's Degree or a Bachelor's degree are:

Occupation	**Annual Job Openings**
1. Secretaries (excluding legal and medical)	3,790
2. Teachers, Secondary school	1,610
3. Registered Nurses	890
4. Teachers, Elementary	830
5. Automotive Mechanics	820
6. Accountants and Auditors	770
7. Computer Programmers	730
8. Data Entry–Insurance	710
9. Social Workers, (Except Med. & Psych.)	700
10. Hairdressers and Cosmetologists	650

Only one of the top ten occupation requires an Associate's degree (registered nurses). Moreover, only 29,700 job openings requiring Associate's degree are projected in the next decade, compared to 119,790 requiring a Bachelor's degree and 57,220 requiring some post secondary education.

Commutation: Surveys conducted on WCC students confirm that the commuting time to and from college is an important factor in attending the College, especially for students thirty and over.

Improvements on the lower Sprain Brook Parkway that are near completion should shorten the commuting time from the Bronx, southern Yonkers, and Mount Vernon. ***Coupled with projected population increases in the southern section of the county, and an increase in the number of Hispanics reaching college age, these commutation improvements provide an additional reason to target new students in the Bronx, southern Yonkers and Mount Vernon.***

Expansion of the Taconic Parkway from four to six lanes in Yorktown (scheduled to begin in 2000) will lengthen the commuting time for students in northern Westchester to the Peekskill and Valhalla campuses until completion. Improvements on 100C at the entrance to WCC down to Virigina Road will also cause delays. ***Measures to indicate the temporary nature of these construction projects and to help abate their inconvenience are recommended.***

Where is Valhalla? This question will be explored in a countywide survey to be conducted next fall, but informal questioning indicates that the College's convenient and central location is not fully working for it.

To be sure, other factors may influence future enrollments at Westchester Community College, such as the development of distance learning, increased demand for remedial education, and more competition from four-year colleges for traditional WCC students. The demographic and economic trends discussed in the report, however, are sure to have an important impact, too.

FINANCING EDUCATION
An Analysis from the Results of the Survey of Graduates 1989-1997

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Introduction

Public debate about the cost and price of higher education has become more passionate in recent years. National data shows that there have been significant increases in tuition and fees, articles appear regularly in newspapers about rapidly increasing tuition prices and legislatures all over the country are asking why universities and colleges charge what they charge.

Within our Council of Presidents and Board of Trustees, like those of many public institutions, there has been much discussion and debate about tuition and fee policies and about financial aid policies in a public, four-year comprehensive university with a mission of providing access to higher education. One recent policy debate has been over the provision of non-need based aid. The data policy makers have examined to date has been the somewhat gross measure of 'unmet need' estimates.

Our goal in this paper is to examine a rich set of data gathered over the past nine years (1989 through 1997) from our graduating seniors and to take a look at student reports on:

- how they have paid for their education,
- what forms of financial aid they have received,
- median amounts of student loans, and
- students' level of concern about student loan repayments

In each case, we will be examining the patterns of stability and change in student respondents' responses.

Before turning to the analysis of payment sources and financial aid, we briefly review the economic background in Connecticut and the characteristics of the students who attend Central, Eastern, Southern and Western Connecticut State Universities. A description of the survey methodology and response rates can be found in appendix A.

Background: State Context

Connecticut, as much of the Northeast, went from times of relative plenty in the late 1980's into an economic recession during the early 1990's. Table 1 shows the increases in tuition and fees over that period of time at the four universities. The average of the four institutions' tuition and fees for full time undergraduate are presented. It is clear that the cost of attendance increased dramatically between 1989 and 1997. The nine year increase was in fact 151%, a rate considerably higher than inflation. The 9 year increase on CPI (Consumer Price Index) was 28% and 30% for HEPI (Higher Education Price Index).

Table 1, Tuition and Fees

Year	$ Amount	% increase
1989	1510	12.4
1990	1586	5.0
1991	1950	23.0
1992	2504	28.4
1993	2927	16.9
1994	3154	7.8
1995	3350	6.2
1996	3479	3.9
1997	3785	8.8

It is true that the tuition and fee prices listed above, even in 1997, are bargain prices. In comparison to the prices of private institutions and to doctoral granting publics, they may look laughably small. We would argue, however, that they are not small amounts to our students.

Background: CSU Student Characteristics

The four universities of the CSU system enroll students typical of four year public, comprehensive institutions. Of the 33 thousand students enrolled just over one half are full time undergraduates, 25% part time undergraduates and the remaining 23% full and part time graduates.

Among the full time undergraduates, most (87%) are traditional age and 13% are 25 and older. Among part time undergraduates, almost two thirds are 25 and older.

Most important as a backdrop to the analysis of student educational financing is the information that almost one half (47%) of CSU students responding to the Surveys of Graduates report that neither of their parents or guardians ever attended college. Only 13% or so report that both parents or guardians have graduated from college. In a state which has a higher than average population of persons 25 and over who have completed college, this is a clear indicator that CSU students are members of families who do not typically fall into high socio-economic ranks.

This is further reinforced by the consistent findings in our Current Student Surveys (1995-1997) that about 80% of the responding students reported they were employed while attending the university. Just over forty percent say that they are employed full-time and almost 40% that they are employed part-time.

Turning to the analysis of student educational financing, we will first examine the student respondents answers to the question, 'How did you pay for your education at CSU'? In the interests of clarity, we will present only three years' of survey results in our analysis; 1989, 1993 and 1997. Data on the intervening years has been examined and is in keeping with the trends discussed.

Paying for Education

In the survey, we asked our graduates 'How did you pay for your education at CSU?' The choices for the answer were: personal earnings or savings, parents' (guardians') support, spouse support, veterans benefits, employer reimbursed my tuition, scholarship from private sponsor, university scholarship, financial aid including loans, vocational rehabilitation or other agency support, and personal loans. Students were encouraged to choose all that apply.

Table 2, Payment for Education

(table presented using percentage)

Payment Method	1989	1993	1997
Personal earnings	63	55	55
Parents support	49	56	45
Financial aid incl. loans	29	25	39
Employer reimbursement	10	10	11
Spouse support	8	6	7
Private scholarship	7	7	9
Veterans benefits	4	3	5
University scholarship	4	7	8
Voc. rehab or other agency	--	1	1
Personal loans	--	--	9

Note: * We began asking the question about vocational rehabilitation or other agency support after the 1989 survey and about personal loans in 1997.

* The columns do not add to 100% as students could select more than one option.

Table 2 shows that in general, personal earnings is the largest source of funding for CSU students. The percentage of graduates who checked personal earning decreased a little between 1989 (63%) to 1993 (55%) but has remained stable since that time.

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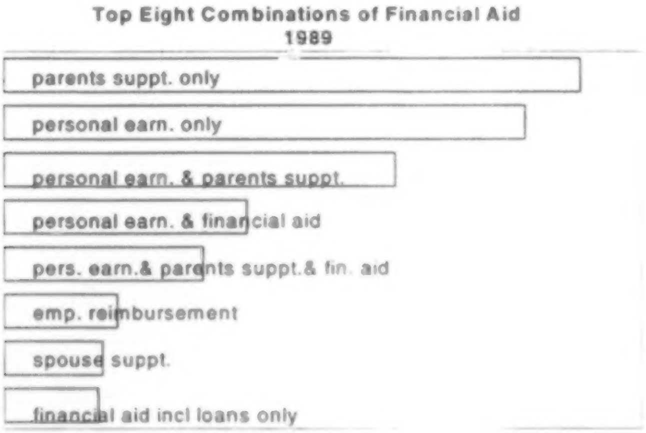
Parental support is the second largest source that CSU graduates used in paying their education. The percentage of respondents who reported that they used parental support for their education showed no dramatic change in the last 9 years

Financial aid was another major source for CSU students. In 1989, a 29% of the respondents reported that they had financial aid. This proportion went down a little during the 90's, to 25% in 1993 but has since risen significantly to 39% in 1997.

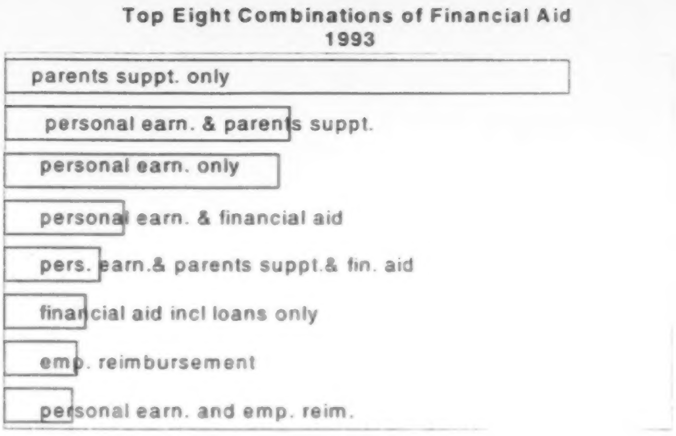
A more detailed analysis was done to see what combinations of financial sources students used to pay for their education. Graph 1 to Graph 3 shows the patterns shifting in the past 9 years for financial aid.

Graph 1



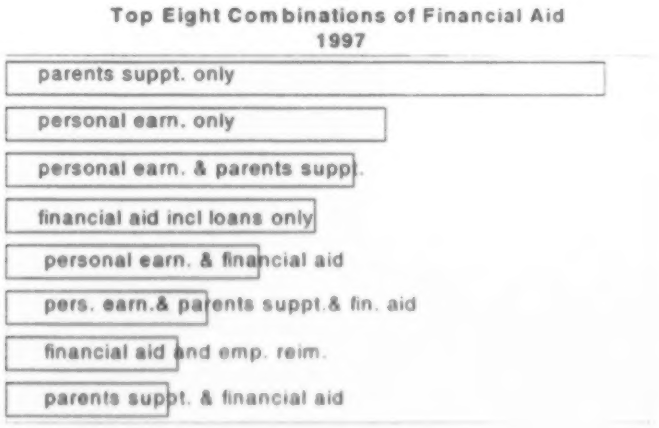
In 1989, majority of the CSU graduates who responded to the survey said parents support or personal earnings was the only source for paying their education at CSU. Financial aid ranked on the bottom of the top eight combinations of payment method.

Graph 2



In 1993, more CSU graduates reported that they were solid depended on financial aid for paying their education. Financial aid ranked as the 6th most important source in 1993. (Graph 2)

Graph 3



By 1997, financial aid as a solid funding source of education went up to be the 4th of the top eight important sources for paying education. (Graph 3)

Overall, the biggest change in the student's self reported sources of funding for education is the increasing role played by financial aid. The percentage reporting reliance on contributions made by students' families and on their own earnings have remained relatively stable and at high levels. This suggests that the increases in tuition costs have not led to increase parental and personal sources of funding, but to increase reliance on financial aid. We therefore turned our attention to the types of financial aid received by the student respondents.

Types of Financial Aid

Students were asked 'What types of financial aid did you receive while attending CSU?' The response choices included: pell grants, work study, student loans, other federal aid, state financial aid, tuition wavers or did not receive financial aid. Students were encouraged to choose all that apply.

The data in Table 3 shows the percentage of students reporting having received one or more forms of financial aid. The columns do not add to 100% as students could select more than one option.

The most frequently cited form of financial aid was student loans. While the percentage of graduates indicating this form of aid decreased from 30% in 1989 to 23% in 1993, it increased significantly between 1994 and 1997, reaching almost 40% of the students who reported financial aid types.

Table 3, Types of Financial Aid Received

(table presented using percentage)

Financial Aid Type	1989	1993	1997
Student loan	30	23	39
Pell grants	15	16	18
Work study	8	6	8
State financial aid	8	8	9
Other federal aid	4	5	8
Tuition waivers	--	4	7
Didn't receive aid	62	65	48

Students who received financial aid often received more than one form of aid. Comparing the combinations of financial aid for 1989, 1993 and 1997, 'student loan only' is still the most frequent form of aid. The following Table 4 shows the detailed data on the financial aid 'packets' for each of the three years.

Table 4, Financial Aid Combinations

Financial Aid Type	1989	1993	1997
Student loan only	269	168	228
Student loan and pell grant	100	122	81
Student loan & one of the other forms (work study, other federal aid, other state aid, tuition wavers)	191	223	196
All other combinations except student loans (pell grant, work study, other federal aid, other state aid, tuition wavers)	131	182	132
Total Number Received Financial Aid	691	695	637
Total Number of Responses	1897	2239	1285
% Receive Financial Aid	36%	31%	50%
% Receive Student Loan only	14%	8%	18%

Table 4 shows that using the aggregated figures for those reporting receiving one or more forms of financial aid, the percentage of all the respondents reporting one or more forms of aid was just over one third in 1989 and just under one third in 1993. By 1997, however, that percentage had increased to 50% of the total respondents. There were 14% of the respondents said student loan was the only source of financial aid. This number decreased to 8% in 93 and back up to 18% in 1997.

In fact, the current student body who depended on financial aid maybe greater than the figures we have from graduates who responded to the survey. In 1997, our finance office reported that 60% of full-time CSU students receive financial assistance, including loans. The loans made to students increased 75% from 1994 to 1997. In 1994, it was 23 million dollars and by 1997, 40 million dollars.

This lead us to questions about loan amounts and concern about repayment.

Loan Indebtedness

The number of graduates who reported having some dollar amount of loan debts was smaller than the number of graduates who reported receiving loans in the previous question. This may be because graduates who are not up-to-date on payments do not want to report or just that some people do not like revealing financial data.

Table 5 showed the three years data on loan amounts for all the graduates who returned the survey.

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Table 5, Amount of Loan

AMOUNT	1989		1993		1997	
	Number	Percent	Number	Percent	Number	Percent
None	1103	58.1	1476	65.9	637	49.6
$1 to $2,499	238	12.5	190	8.5	49	3.8
$2,500 to $4,999	214	11.3	186	8.3	65	5.1
$5,000 to $7,499	137	7.2	137	6.1	104	8.1
$7,500 to $9,999	88	4.6	90	4.0	67	5.2
$10,000 to $12,499	48	2.5	47	2.1	109	8.5
$12,500 to $14,999	17	0.9	18	0.8	76	5.9
$15,000 or more	7	0.4	33	1.5	149	11.6
Total	1852	97.6	2177	97.2	1256	97.4
Didn't give an answer	45	2.4	62	2.8	29	2.3
Total Responses	1897	100.0	2239	100.0	1285	100.0

The median student loan indebtedness in 1989 was $4,100, and by 1993 was in $4,663. However, by 1997, the median student loan indebtedness was $10,573, a 158% increase from 1989. The change was so significant that we checked and rechecked the calculations, wondering if we had made a mistake. We do not think that we have. Students are not only relying increasingly on financial aid, but they are relying increasingly on loans and in increasing amounts.

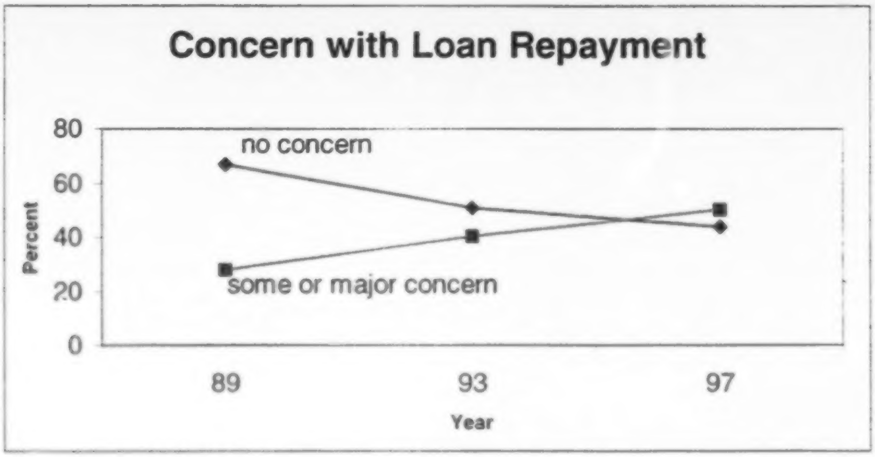
Are they concerned about load indebtedness?

Concern about Loan repayment

Among those respondents who reported some dollar amount of loan debt, we examined their responses to the question about concern with loan repayment. Response options included: no loans, no concern, some concern, major concern, and 'expect that my family will pay'. Graph 4 shows that there has been a big change in our students' responses between 1989 and 1997.

The percent of the respondents who reported that they had no concern at all about repayment dropped from 67% in 1989 to 51% in 1993 and to 44% in 1997. The respondents who had some concern or major concern increased from 28% in 1989 to 40% in 1993 and 50% in 1997. The percentage of students who expect families to pay back their indebtedness is very small, less that one percent.

Graph 4



Summary of findings

- While our tuition and fees are comparatively low, they have increased significantly over the last 9 years.
- The price we are charging for education is a struggle for our students and their families. The most significant sources of funding for education among our students continue to be their own earnings and their families.
- There has been a dramatic increase in reliance on financial aid, especially in the last four years.
- There has been a shift within financial aid sources to more student loans.
- The median amount of loan indebtedness has increased dramatically in the last four years.
- Students are increasingly concerned about their ability to repay education loans.

Policy implications

- Our students and their families are clearly contributing as much as they can from their own pockets to pay for their education. It appears that those sources have reached their limits and more students are relying on financial aid to fill the gap. What ought we to be doing in response to this? Holding tuition and fees steady? Requesting that the state resume a greater responsibility for the costs of instruction? Pouring more money into financial aid?
- National policy decisions have put more emphasis on loans than grants in recent years and our students are increasingly feeling the burden of this shift. Are there ways in which we could reduce the reliance on student loans for college costs, particularly among our less wealthy students?
- Students are expressing heightened degrees of concern about debt. Can we provide

services which help them to plan debt management? Are there loan forgiveness programs we could develop targeted at sectors of the Connecticut economy in which employers are currently having difficulty hiring?

- Are we doing enough within university resources to provide financial resources to students? Do we need to plan and implement the development of significant scholarship funds?
- How does the increasing reliance on financial aid square with our mission of access? Is the need to borrow reducing the number of students and families able to attend college?

We hope that our analysis provides useful information for our policy makers as they struggle with these questions.

Appendix A

I. Survey Back Ground:

In 1989, the Connecticut State University system initiated an annual survey of graduating seniors and which has been collected every year since that time. Typically, the surveys are mailed out in late fall/early winter, followed up with a postcard reminder and finally, three weeks later, another complete survey. The data are used at the campus and the system level for analysis of the post-graduation activities of our graduates as well as analysis of their undergraduate experience with programs and services at CSU. The survey instrument also includes questions on students' employment during their undergraduate careers, their image of their campus and their strategies for financing their education.

II. Response Rates

The response rate were higher in the early 90's and dropped to 34 % in 1997

1989	1990	1991	1992	1993	1994	1995	1996	1997
51%	54%	50%	48%	49%	53%	47%	38%	34%

III. Nine years of data on the percentage of students using each payment source for their education at CSU. Table presented using percentages. The columns do not add to 100% as students could select more than one option.

Payment Source	1989	1990	1991	1992	1993	1994	1995	1996	1997
Personal earnings	62.6	63.5	61.7	60.7	55	57.8	54.3	57	55.3
Parents supported	48.6	50.6	51.7	54.9	56.4	50.7	48.8	47.7	44.7
Spouse supported	7.8	8	9.1	6.6	6.1	5.4	5.7	6.6	7.2
Veterans benefits	3.6	4.3	3.8	3.4	3.4	3.8	4.5	5.7	5
Employer reimbursement	9.9	10.4	10.9	10.3	10.1	12.3	12.1	11.5	11
Private scholarship	7.2	7.1	7.1	6.7	7.3	7.5	7.4	7.9	9.4
University scholarship	4.3	3.7	6.4	5.6	7.2	5.5	8	8.5	8.3
Financial aid incl. loans	29	25.6	22.8	24.2	25.4	27.3	32.3	37	39.2
Vocational rehabilitation or other agency	--	1	0.9	0.9	1	1.3	1.3	1.8	0.9
Personal loans	--	--	--	--	--	--	--	--	9.3

IV. Nine years data on financial aid type for those students who reported having financial aid while attending CSU. Table presented using percentage. The columns do not add to 100% as students could select more than one option.

Financial Aid Type	1989	1990	1991	1992	1993	1994	1995	1996	1997
Student loan	29.5	23.4	19.9	21	22.9	25.4	30.7	34.1	39.3
Pell grants	15	13.5	14.3	13.3	15.6	14.2	16	17.2	18.3
Work study	7.9	6	5	4.9	5.5	6.6	5.5	7.6	7.5
State financial aid	7.6	6.1	6.2	7.1	7.7	7.1	7.3	8	8.6
Other federal aid	3.9	4.3	4.1	4.9	4.8	3.8	6.3	6.9	8.2
Tuition waivers	--	--	3.5	3.4	3.5	5.1	5.2	6.3	6.7

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The Impact of Outsourcing Auxiliary Enterprises
On
Educational Expenditures Per FTE

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Introduction

Identifying peer institutions and appropriate strategic indicators providing valid comparisons between institutions is an underlying theme related to benchmarking institutional measures of efficiency. As such, the relationship between reported financial ratios has come under closer scrutiny, especially with changes introduced by Statement of Financial Accounting Standards (SFAS) No. 117. In particular, the Educational Expenditure per FTE, as defined in U.S. News and World Report's 1998 Undergraduate Ranking Criteria & Weights (U.S. News and World Report), is affected by the extent to which operation and maintenance of plant and depreciation are allocated to the components of total educational costs, i.e., instruction, academic support, student services and institutional support, subsequent to the implementation of SFAS No. 117.

In institutions where a larger portion of operation and maintenance of plant and depreciation are allocated as indirect costs to auxiliary enterprises, allocated operation and maintenance of plant and depreciation would have less of an impact on overall educational costs. Because institutions vary in what is included under auxiliary enterprises; which, if any, auxiliary enterprises are outsourced; as well as whether any indirect costs are allocated to auxiliary enterprises that are not outsourced; comparisons of ratios involving educational costs are not necessarily valid. In order to have valid comparisons involving educational costs per FTE across institutions, additional information is needed about auxiliary enterprises, outsourcing and allocation of indirect costs.

Background

A review of the literature indicates that very little research has been conducted regarding the effects of outsourcing auxiliary enterprises. The most extensive study was conducted by Lee White (White, 1997). This study reports means for various financial ratios, by type of institution (public/private) and by Carnegie classification, for self-operated and vendor-operated auxiliary activities. However, no statistical analysis was performed and the financial data are for the 1994-95 fiscal year, prior to the adoption of SFAS No. 117.

A review of the literature could not identify any research pertaining to the effects on inter-institutional comparisons of allocating indirect costs to educational expenditures.

Other groups are attempting to provide inter-institutional comparisons of direct educational costs by program. One such group is those institutions participating in a FIPSE-funded study of instructional costs and productivity being carried out by the University of Delaware. Ratios developed by the National Study of Instructional Costs and Productivity (NSICP) provide institutions with information that allows inter-institutional comparisons between instructional costs grouped by CIP codes which may represent either programs and/or departments. Comparisons provided by the NSICP for small and medium-sized private independent institutions are not satisfactory due to program portfolio diversity among the institutions and also the small number of private institutions participating in the study. This study is limited to instructional costs and does not include the other components of educational costs (student services, academic support and institutional support). Also, indirect expenditures are not separately identified as part of the NSICP study. Reasons for non-participation in the study range from small institutional research offices to a lack of time and money to collect the data necessary for participation.

The purpose of the research study described below is to document the extent to which strategic indicators involving educational costs are affected by the different ways in which indirect costs are allocated within institutions. The research study further proposes to determine whether a relationship exists between an institution's decision to outsource auxiliary operations and its decision to allocate indirect costs to auxiliary enterprises. The lack of consistency across institutions in the allocation of indirect costs to auxiliary enterprises has rendered some inter-institutional financial ratio comparisons meaningless. It is this problem that the proposed research will attempt to clarify.

Rationale

The extent to which an institution outsources its auxiliary enterprises can affect the extent to which indirect expenses are allocated to auxiliary enterprises and in turn, affect the extent to which indirect costs are allocated to the functional classifications within educational and general expenditures. When selecting peer institutions to compare strategic indicators, it may be helpful to know the extent to which institutions outsource auxiliary enterprises. In addition, practices among private institutions differ in what is included in the category of auxiliary enterprises, as well as whether indirect expenses other than depreciation are taken against the revenues generated by auxiliary expenditures.

Statement of Financial Accounting Standards (SFAS) No. 117, *Financial Statements of Not-for-Profit Organizations*, recommends that private institutions allocate expenditures relating to operation and maintenance of plant and depreciation among the functional expenditure classifications and auxiliary enterprises. Assuming most institutions would comply with those guidelines, schools in our study were not simply classified as to whether they allocated indirect expenditures, but as to whether they allocated indirect expenditures other than depreciation. Subsequent to the adoption of SFAS No. 117, with the allocation of operation and maintenance of plant and depreciation among the other categories of expenditures, there may be an even wider gap in strategic indicators of institutions, depending upon the extent to which auxiliary enterprises are outsourced.

The research study examined the relationship between strategic indicators involving educational costs and the outsourcing of auxiliary enterprises. Three research questions were investigated.

1. Are institutions that outsource auxiliary operations less likely to allocate indirect costs other than depreciation to these operations?
2. Is there a difference in mean Educational Expenditures per FTE between schools that outsource and those that do not outsource?
3. Are there increased differences in Educational Expenditures per FTE following the adoption of SFAS No. 117, as reflected in the FY97 IPEDS Finance Survey data, between schools that do/do not outsource?

As part of the research study information was collected about what operations were included in auxiliary enterprises, and which operations were outsourced. Additional information about the percentage of students in residence halls, the size of the endowment, and tuition was collected to help clarify factors contributing to Educational Expenditures per FTE.

Sample

The 340 four-year private colleges and universities that are members of EACUBO (Eastern Association of College and University Business Officers) were sorted by Carnegie classification and FTE enrollment based on IPEDS Enrollment Survey data. The 77 members classified as specialized institutions were excluded. Auxiliary revenue data from the FY96 IPEDS Finance Survey was downloaded from the Internet to determine which of the institutions had non-zero values for auxiliary revenues and expenditures. Only institutions with non-zero auxiliary revenues and expenditures were included in the study. After group membership (Carnegie class by size) was determined, a stratified random sample of 121 institutions was selected for participation. Business officers at each institution were contacted and invited to participate in the study. Of those contacted, 110 agreed to participate by completing a telephone survey. Examination of enrollment and auxiliary revenue and expenditure data revealed three outliers with enrollment less than 200 and unusual auxiliary data, leaving 107 institutions. The FY97 IPEDS Finance Survey was requested from the institution since these surveys would not be publicly available until late 1998. Only eight institutions refused to release this information, resulting in complete data for 99 institutions. Follow-up telephone calls were made to clarify responses inconsistent with data reported on the IPEDS Finance Survey.

The sample by Carnegie classification consisted of 29 Bachelor's I, 29 Bachelor's II, 27 Master's I, 6 Master's II, 8 Doctoral and 8 Research institutions. Because of the small number of Doctoral, Research and Master's II institutions, the Master's I and II institutions were collapsed into one group, and Doctoral and Research became one group for some analyses.

Survey Instrument

Using the survey instrument, data were collected regarding which operations were included under auxiliaries, and which of these operations, if any, were outsourced. Questions about the allocation of indirect costs related to the types of indirect costs allocated (e.g., depreciation, maintenance, utilities, etc.), the allocation basis used (e.g., square footage) and to which operations indirect costs were allocated.

Follow-up telephone calls were made where large differences between FY96 finance data and FY97 finance data were noted. A few of the institutions reported data incorrectly on the IPEDS Finance Survey, reporting in thousands of dollars instead of in whole dollars. Follow-up telephone conversations also were made to clarify seeming inconsistencies between data on the IPEDS Finance Survey and data obtained during the telephone interview. Several business officers responded that their school did not allocate depreciation to auxiliary enterprises, yet information on the IPEDS Finance Survey clearly showed that depreciation was allocated. Other institutions did not know which indirect costs were allocated because the auditors made the allocation. In a few cases, there were major shifts in data reported in the finance data between FY96 and FY97 and the information was determined to be reported accurately.

Results

In describing which operations institutions included under auxiliaries, the reader should note that an institution may have a particular operation on its campus and yet not include it under auxiliary operations. For example, if a day care center is operated only for the convenience of faculty staff and students, but is not used for educational experiences, then it probably is included as an auxiliary operation. On the other hand, a day care center used by the early childhood education department as a site for students' practicum experiences would be classified as educational. In Table 1 below operations included as part of auxiliaries are listed along with the number of schools reporting. Operations included by at least one institution were facilities rentals, stores other than bookstores, golf courses, computing, camps, recycling, transportation, theatres, housekeeping, laundry, press/publications, and orientation/commencement fees.

Table 1

Operations Included in Auxiliaries

Operation	Number of Schools*
Food Services	104
Residence Halls	104
Bookstore	94
Vending	74
Printing	24
Athletics	22
Parking	21
Health Services	12
Day Care	11

*N = 110

Outsourcing Operations

Of the 110 institutions that responded to the telephone survey, 22 reported that no auxiliary operations were outsourced. There was no clear pattern based on Carnegie class or enrollment that would predict who was more likely to outsource operations. Examination of the percentage of resident students showed that most (18) of these 22 institutions had primarily resident students ranging from 60% to 97%. A moderate correlation ($r = .43$, $p < .0001$) between percent of residents and not outsourcing was found. Among the remaining 85 institutions a variety of auxiliary operations were outsourced. These included food services, bookstore, vending, printing, parking, facilities rentals and cable television. The number of schools that outsourced each operation is shown in Table 2 below.

Table 2

Auxiliary Operations Outsourced

Operation	Number of Schools*
Food services	75
Bookstore	45
Vending	45
Printing	4
Parking	1
Facilities Rentals	1
Cable Television	1

*N=110

Of the 85 schools that outsource at least one operation, 39 outsource both the bookstore and food services, another 36 only outsource food services but not the bookstore, five outsource the bookstore and not food services and four only outsource vending and one only outsourced printing. Not surprisingly, 75% of institutions with food service in auxiliaries outsource food services, while only 48% outsource the bookstore. Operations not outsourced by any of the institutions in the sample were residence halls, athletics, health services and day care centers.

Allocation of Indirect Costs

As shown in Table 3 below, there is a clear relationship between those schools that do not outsource food services and those that allocate indirect costs other than depreciation to food services. This result was not unexpected since an institution that provides its own food services, i.e., does not outsource, is more likely to accumulate all costs associated with food services, whether direct or indirect. What was an unexpected finding is that 69% of those who outsource food services (and therefore do not have any direct expenditures for food services) still allocate indirect expenses to food services. Since 81 of the 103 institutions were found to be allocating indirect expenses other than depreciation to food services, the impact of outsourcing food services was expected to be less important in affecting changes in the Educational Expenditures per FTE after the adoption of SFAS No. 117 as reflected in the FY97 IPEDS Finance Survey.

Table 3

Food Services Outsourced By Allocation of Indirect Expenses

	Food Services Outsourced?		
Allocate to food services?	No	Yes	Total
No	3	19	22
Yes	25	56	81
Total	28	75	103

$\chi^2 = 2.59, df=1, p=.09$

As shown in Table 4 below the results of comparing the outsourcing of the bookstore operation with those who do/do not allocate indirect costs are quite different than for food services. Although 64% allocate indirect costs independent of whether the bookstore is outsourced, exactly half of those who outsource bookstore allocate indirect costs. Again, since there is no strong relationship between outsourcing and not allocating indirect costs, the effect of SFAS No. 117 on Educational Expenditures per FTE would not be as great as originally expected.

Table 4

Bookstore Outsourced By Allocation of Indirect Expenses

	Bookstore Outsourced?		
Allocate to Bookstore?	No	Yes	Total
No	12	22	34
Yes	38	22	60
Total	50	44	94

$\chi^2 = 6.85, df=1, p<.01$

Impact on Educational Expenditures

The means for Educational Expenditures per FTE for FY96 and FY97 by Carnegie class are shown in Table 5 below. Recall that the effect of implementing SFAS No. 117 would predict an increase in Educational Expenditures for FY97 since the dollars in Operation and Maintenance of Plant were allocated among other expenditure categories, including instruction and auxiliaries among others. Note the variation among the Carnegie classes in Educational Expenditures per FTE, especially the Research I and II institutions. The increase from FY96 to FY97 is expected, and is fairly consistent except for the group of 6 Master's II institutions and the Doctoral and Research institutions. One might argue that any change in the ratio could be attributed to a change in FTE as well as a change in educational expenditures. This hypothesis was tested and for the sample in this study enrollment change in FTE was shown not to have an effect between 1996 and 1997. Although the means for each Carnegie class increased from FY96 to FY97, three institutions actually showed decreases in Educational Expenditures per FTE. Each of the decreases was less than $1,000.

Table 5
Mean Educational Expenditures per FTE FY96 & FY97

By Carnegie Class

		Mean Educational Expenditures per FTE	
Carnegie Class	N	Fiscal Year 1996	Fiscal Year 1997
Bachelors I	29	$17,240	$20,376
Bachelors II	29	10,934	12,584
Masters I	27	9,596	11,565
Masters II	6	8,776	9,798
Doctoral I & II	8	17,438	22,474
Research I & II	8	39,956	52,293
	10	$14,998	$18,405

The mean Educational Expenditure per FTE for all institutions that outsourced any operation for FY96 was $12,455 and it increased by $2,625 in FY97 to $15,080. For institutions that did not outsource any auxiliary operations the Educational Expenditure per FTE for FY96 was $14,541 which increased by $2,224 to $16,765 in FY97. The difference between groups is not significant; confirming that outsourcing is not the only factor to consider in accounting for change in Educational Expenditures per FTE following the implementation of SFAS No. 117.

Based on earlier results showing that institutions were just as likely to allocate indirect expenses other than depreciation regardless of whether an operation was outsourced, a repeated measures ANOVA with two independent factors was run. One independent variable was allocation of indirect costs to food services and the second level was outsourcing of food services. The results shown in Table 6 below show that differences in Educational Expenditures per FTE from FY96 to FY97 (Time) are significant ($F = 28.2$, $df = 93,1$; $p < .000$) for the sample. Allocation of indirect costs other than depreciation is also significant ($F = 9.57$, $df = 93,1$; $p < .005$), confirming the results on food services outsourcing and allocation. Note too that outsourcing of food service is not significant by itself or in its interaction across FY96 and FY97.

Table 6
Repeated Measures Analysis
Educational Expenditures Per FTE FY96 and FY 97

Within Ss	df	Mean Square	F
Time	1	68,823,819	28.19***
Time x Allocate other than depreciation	1	16,520,168	6.77*
Time x Outsource food service	1	155,237	.064
Three-way interaction	1	4,432,645	1.82
Error	93	2,441,345	
Between Ss			
Allocate other than depreciation	1	632,975,417	9.57**
Outsource food services	1	100,335,545	1.52
Allocate x Outsource food services	1	171,525,927	2.59
Error	93	66,160,678	

* $p < .01$
** $p < .005$
*** $p < .0001$

A regression analysis was run in an attempt to account for variation in the change of Educational Expenditures per FTE from FY96 to FY97. Independent variables used in the research study such as outsourcing, allocation of indirect costs, Carnegie class and size were used. The results were not significant with less than 25% of the variance accounted for by this model

The results indicated that other variables would be more closely related to educational expenditures than those selected. Such variables would include those relating to an institution's ability to spend more on educational expenditures per FTE enrollment, such as full-time tuition price per student, net tuition per FTE enrollment, and the market value of the institution's endowment per FTE enrollment. Another factor contributing to an institution's increase in educational expenditures is the magnitude of an institution's FY96 expenditures for operation and maintenance of plant, which would be allocated among other expenditure categories for fiscal year 1997. The following correlation matrix supports these hypotheses.

Table 7

Correlations

	Ed. Costs per FTE 1996	Ed. Costs per FTE 1997	Academic Reputation Score (USNWR)	Tuition Price 97-98	Net Tuition per FTE 1996	Net Tuition per FTE FY97	Mkt. Value Endowment per FTE 6/30/96
Ed.Costs/FTE FY97	.977						
Academic Reputation	.564	.544					
Tuition Price 97-98	.609	.602	.635				
Net Tuition/FTE FY96	.558	.577	.541	.804			
Net Tuition/FTE FY97	.564	.547	.639	.713	.877		
Endowment/FTE	.752	.728	.688	.523	.386	.533	
Plant Exp/FTE FY96	.716	.727	.432	.446	.342	.374	.686

All Significant beyond .001

A post hoc exploratory analysis using stepwise regression was conducted in an attempt to account for variation in Educational Expenditures per FTE for FY97. Independent variables used in the full regression model were selected from those variables shown to be highly correlated with education expenditures per FTE. Those selected were: market value of endowment per FTE, plant expenditures per FTE, 1997-98 full-time tuition price, and academic reputation score from US News & World Report 1998 College Rankings . The results were significant with 67% of the variance accounted for by the first three variables listed above. Endowment per FTE accounted for the majority of the variance, with 51%. Only academic reputation score did not add significantly to the explained variance. Further research will continue to investigate the relationships indicated in the above analysis.

Conclusions

Based upon the results of the research with the sample of 99 institutions, it appears that institutions that outsource auxiliary operations would not be any less likely to allocate indirect costs other than depreciation to these operations. There is no significant difference in mean educational expenditures per FTE between schools that outsource and those that do not outsource. Although there were significant increases in educational expenditures per FTE from FY96 to FY97 for the sample, allocation of indirect costs other than depreciation was found to be a significant factor, rather than outsourcing auxiliary operations. An institution's policy on allocation of indirect costs, rather than outsourcing, should be considered in selecting peer institutions.

A post hoc analysis revealed significant relationships between measures of institutional resources, such as endowment and revenues from tuition, and expenditures for operation and maintenance of plant. Academic reputation score was also found to be highly correlated with these measures.

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MATH ACHIEVEMENT AND MATH COURSE-TAKING

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INTRODUCTION

Educational research has identified many factors that relate to student achievement - one of which includes math achievement. Math achievement is often associated with academic and professional success. Students with a strong grasp of mathematics are more likely to go to college and have an advantage in the job market (U.S. Department of Education, 1997).

Despite our understanding of the importance of math achievement, U.S. students have not performed as well in math as students in other countries of similar political and economic conditions (U.S. Department of Education, 1997). The Third International Math and Science Study (TIMSS) by the U.S. Department of Education indicates that U.S. fourth grade students performed above the international average in math in 1993, but achievement of the middle and high school students were consistently below the international average. U.S. students performed particularly poorly in geometry compared with students from the 21 countries that participated in the study (U.S. Department of Education, 1998).

A growing area of interest in math achievement research is study of students' course-taking patterns. Some studies have shown that math coursework is related to student success. Research from the 1990 National Assessment of Educational Progress (NAEP) suggest that math coursework is related to high math achievement (Viadero, 1993). The NAEP study analyzed the content of courses and found a link between test scores and specific topics discussed in math classes. Algebra and geometry were key topics that were related to math achievement.

A more recent paper produced by the U.S. Department of Education, "Math Equals Opportunity", (U.S. Department of Education, 1997) finds that 8th grade algebra is a critical factor in predicting students likelihood of attending college. Nearly 83% of students who took algebra I went to college, while only 36% of those who did not take algebra I went to college (U.S. Department of Education, 1997). The study also revealed that 60% of students who took algebra I went on to take calculus in high school.

A few studies have examined the relationship between taking more rigorous coursework and student achievement (ACT & CGCS, 1998; U.S. Department of Education, 1996). Data from the 1992 NAEP suggest that students who enrolled in higher-level math courses "had consistently higher average proficiencies" than students who were not enrolled in higher-level math courses (U.S. Department of Education, 1996).

The Council of the Great City Schools and the ACT Inc. examined student achievement of urban test takers. The data indicate that ACT test-takers who took more rigorous courses did better on ACT tests in all subject areas than those who did not. In particular, students who took trigonometry and calculus scored 30% higher on achievement tests than those who did not. Students who completed only the core math courses averaged 16.2 math achievement score, while students who completed trigonometry and calculus averaged 22.7. Although this study is not generalizable to the larger population of students due to the selection process, the results suggest that all students can benefit by taking advanced math courses (ACT & CGCS, 1998).

Research suggests that rigorous coursework can benefit students of all racial and gender groups equally, however a gap still exists between low and high socio-economic groups. Research shows that students from more affluent communities are more likely to be high achievers and that private school students tend to do better in math (Peng, 1994; & Gamoran, 1996a). Another study by Gamoran (1996b) suggests that students in inner city schools tend to lack the expectations, trust, and interpersonal obligations that most high achievers enjoy.

What is the relationship between student course-taking patterns, student achievement, and socio-economic status? The ACT & CGCS study found that advanced coursework increased scores regardless of socio-economic status; however, students with a lower socio-economic background still lagged behind those of a higher socio-economic background (ACT & CGCS, 1998). The U.S. Department of Education (1997) found that students of a low-income background were much more likely to go to college if they had taken algebra I and geometry (U.S. Department of Education, 1997). However, the disparity between low and high socio-economic groups still exists.

Table 1
Percent of Students Attending College
By Completion of Algebra I and Geometry

	Completed Alg I/Geom	
SES	YES	NO
Low	71	27
Middle	84	44
High	94	60

Source: U.S. Department of Education, 1997

Even within the group that took the base-level math courses, a 33% difference exists between low SES and high SES students' college-going rate. Is it possible that math courses have different effects on low and high socio-economic students? How do these differences play out in achievement scores?

Course-taking is one of the strongest factors that schools have to influence student achievement; however, little research is available on the relationship between course-taking patterns and achievement. A recent study on course-selection procedures (Spade, Columba, & Vanfossen, 1997) suggests that high SES students have more advanced courses and a more elaborate course-selection procedure available to them. Spade, Columba, & Vanfossen examined case studies of six high schools in 3 socio-economic groups with both high and low performing standards. The study investigated the curriculum and curriculum selection in each school. A large disparity in the involvement of schoolteachers and counselors in the course-selection procedures exists between the affluent schools and the working-class and middle-class schools. Poorer students had fewer courses, less involvement with teachers and counselors, and less time to make selections than wealthier students (Spade, Columba, & Vanfossen, 1997).

Problem

Students are typically required to complete two or three years of high school math to meet graduation requirements. Most students take only algebra I and geometry. Less than 20 percent of all students take high school trigonometry (U.S. Department of Education, 1997).

This study examines the course-taking patterns of students in the U.S. and how patterns of course-taking relate to achievement scores for students of low and high socio-economic backgrounds. The study also examines the relationship between math coursework and math achievement.

Course-taking analysis is usually complicated by the task of capturing, quantifying, and equating course information across school districts. Few national databases exist that include course data and math achievement for analysis. The U.S. Department of Education has collected this data in the National Educational Longitudinal Study of 1988 (NELS88).

Using the NELS88 data, this study examines the relationship between math course-taking patterns and math achievement. First, this study will investigate students' math course-taking patterns and their corresponding math achievement scores -- for the total population and by socio-economic status. Do the course-taking patterns differ for each group? If so, are these differences related to achievement differences?

Second, I introduce a model of analyzing coursework and math achievement. After adjusting for differences in students' race, sex, and prior math achievement, I will determine how math courses contribute to math achievement. In particular, which math courses contribute the most to math achievement? Finally, do math courses contribute comparably to math achievement for both low and high socio-economic groups?

METHOD

Data Source

The data for this study come from the U.S. Department of Education's National Education Longitudinal Study of 1988, administered by the National Center for Educational Statistics (NCES). In 1988, NCES began collecting data on a representative sample of 25,000 8th graders in the U.S. Follow-up studies were completed every two years identifying students' progress through and beyond high school. The sample used for this analysis consists of 16,489 students drawn from the base year (8th grade) and the second follow-up (12th grade) studies. In the base year, the first follow-up, and the second follow-up, the Educational Testing Service administered achievement tests in reading, science, and math. In addition to achievement test scores, information on family characteristics and course units were also collected. Many other variables were collected; all of which cannot be discussed here. Although some data were missing, pairwise deletion of cases and imputation of missing items by subgroup were used to complete the dataset. The survey had a response rate exceeding 90%.

Variables

The primary variables of interest are math course-units completed, math achievement scores, and socio-economic status. Secondary variables of interest include race, sex, and prior math background. Because of the longitudinal nature of the NELS88 data, this analysis is designed to control for demographic variables and prior math experience so as to isolate portions of math achievement that may be attributable to math coursework.

The course-taking patterns are identified using course variables: algebra I, geometry, algebra II, trigonometry, and calculus, from the second follow-up study. Each course variable is a composite of the number of Carnegie units in math completed by each student. One course unit is the equivalent of one full year of coursework. Course units vary from 0 to 4, with the average around 1.0. Students who completed at least some of the course were considered course-completers. Calculus and precalculus are combined into one variable because students usually take one or the other.

The 12th grade math achievement scores are used as the criterion variable to measure the effects of math coursework. Standardized scores are typically used nationally by college admission boards as a measure for comparing student performance. Approximately 3,000 students from the NELS 88 study did not complete the 12th grade standardized math achievement test in 1992. The missing data spanned all race, gender, and SES groups, indicating no obvious bias in the missing scores. Imputation of the means, by each of the subgroups, was used to complete the data set.

Three demographic variables are used in this analysis: race, sex, and socio-economic status. All three are composite variables that combine questions that have been drawn from several surveys in the NELS88 study. Socio-economic status is used as a comparison variable to look at how the relationship between math course-taking and math achievement may differ for each group. SES is grouped into 4 quartiles. Only the first and fourth (highest and lowest) quartiles are used in this analysis. The low SES group includes students in the lowest quartile of the combined SES category and the high SES group includes students in the highest quartile of the combined SES category. (Thus, students in the middle were excluded from the comparison.) To adjust out differences that may be due to race and sex, the regression analysis uses these two variables as covariates.

The 8th grade math achievement scores are also used as a covariate to reconcile differences in different math backgrounds. Correlation analysis indicates that 8th grade math achievement is highly correlated with 12th grade math achievement. By controlling for prior math experience, math achievement differences can be more distinctly attributable to course-taking patterns.

Analysis

Correlation analysis explores the relationships between the 12th grade math achievement and the 8th grade math achievement, the 5 course variables, race, sex, and socio-economic status.

Course-taking patterns of various groups are identified by the frequency of students who completed units in each of the five high school math courses. Students who have some course units are considered completers. Students who have zero units are considered non-completers. For each group within each course, an average math achievement score is reported. The same data are reported for the low SES group and the high SES group.

Forward regression analysis is used to compare seven incremental math course-taking models. The dependent variable is 12th grade math achievement. Race, sex, and prior math achievement are the covariates. The five math courses are the independent variables. First, race and sex are entered into the equation, followed by the 8th grade math achievement. The five math courses are entered on next five steps in the order in which they would be taken: algebra I, geometry, algebra II, trigonometry, and calculus/precalculus.

From the regression results model summary, the change in the amount of explained variance (R square) is calculated. The change in explained variance attributable to each model provides a meaningful measure of comparison for each course. In addition, a method typically known as "ordered regression" is used to determine the significance of the amount of change in explained variance contributed by each variable. The incremental increase in the sum of squares in the analysis of variance is measured. Using the residual from the final model, a new mean square and F statistic is calculated for each model.

RESULTS

The correlation matrix in Table 2 demonstrates the strength of the relationship among the five course variables, prior math achievement, and the 12th grade math achievement scores. All correlations are significant at the .01 level. Prior math achievement and 12th grade math achievement have the highest correlation. Algebra I has the lowest correlations with prior math achievement, trigonometry, and calculus. (See table 2.)

TABLE 2
CORRELATION MATRIX

	PRIOR MATH	ALG I	GEOM	ALG II	TRIG	CCALC	MA ACH
PRIOR MATH	1.00	0.26	0.42	0.40	0.35	0.48	0.76
ALG I	0.26	1.00	0.68	0.50	0.26	0.26	0.27
GEOM	0.42	0.68	1.00	0.64	0.37	0.38	0.46
ALG II	0.40	0.50	0.64	1.00	0.30	0.33	0.43
TRIG	0.35	0.26	0.37	0.30	1.00	0.37	0.37
CCALC	0.48	0.26	0.38	0.33	0.37	1.00	0.50
MA ACH	0.76	0.27	0.46	0.43	0.37	0.50	1.00

NOTES: All correlations are significant at the 0.01 level (2-tailed). PRIOR MATH = 8th grad math achievement; MA ACH = 12th grade math achievement score; CCALC = combined pre-calculus and calculus.

The 12th grade math achievement test has an overall average of 50.4 and a standard deviation of 8.9. The averages by course participation for the total sample, the low SES group, and the high SES group are provided in Table 3.

TABLE 3
AVERAGE MATH ACHIEVEMENT SCORE BY COURSE ENROLLMENT

all students = 16,396

	no	Average	yes	average	Difference
algebra I	5,120	47	11,276	52	5
Geometry	8,097	46	8,299	54	8
algebra II	10,245	47	6,151	55	8
Trig	14,037	49	2,359	58	9
ccalc	13,939	49	2,457	61	12

low ses students = 3,867

	no	Average	yes	average	Difference
algebra I	1,808	42	2,060	46	4
geometry	2,774	43	1,093	49	6
algebra II	3,082	43	786	51	8
trig	3,687	44	181	53	9
ccalc	3,705	44	163	56	12

high ses students = 4,271

	no	Average	yes	average	Difference
algebra I	913	56	3,358	57	1
geometry	1,258	54	3,014	58	4
algebra II	1,941	55	2,330	58	3
trig	3,159	55	1,113	60	5
ccalc	2,976	54	1,295	62	8

Note: ccalc combines pre-calculus and calculus: approximately 400 out of the total 1,460 took both courses.

The seven-step regression produced significant F-statistics at all steps. However, in order to evaluate the significance of the incremental change in the explain variance due to each variable, ordered regression analyses were conducted. Table 4 presents the results of the ordered regression. The sum of squares (SS) and degrees of freedom (DF) represent the increase from the previous model. A new mean square (MS) and F statistic (adjusted for design effect) are calculated using the residual from the final model. Significance levels were determined by the .05 alpha level. In all models prior math experience provided the largest F-statistic, as expected. All coursework provided significant contributions to math achievement in the Analysis of Variance table for all students. In the models for the low SES students, all courses except trigonometry showed significance. The high SES students showed significance for all course gains except algebra I and algebra II.

TABLE 4
ORDERED REGRESSION RESULTS

ANOVA TABLE FOR ALL STUDENTS

Model	SS	DF	MS	F*	Sig
Race/Sex	16661.55	2.00	8330.78	283.39	*
Prior Math	702735.76	1.00	702735.76	23905.34	*
AlgI	6617.16	1.00	6617.16	225.10	*
Geom	23937.74	1.00	23937.74	814.30	*
AlgII	6853.43	1.00	6853.43	233.14	*
Trig	5854.43	1.00	5854.43	199.15	*
Ccalc	13740.03	1.00	13740.03	467.40	*
Residual	463410.65	15764.09	29.40		

ANOVA TABLE FOR LOW SES STUDENTS

Model	SS	DF	MS	F*	Sig
Race/Sex	1996.10	2.00	998.05	11.15	*
Prior Math	69363.61	1.00	69363.61	774.92	*
AlgI	3399.25	1.00	3399.25	37.98	*
Geom	3525.71	1.00	3525.71	39.39	*
AlgII	3119.53	1.00	3119.53	34.85	*
Trig	228.46	1.00	228.46	2.55	
Ccalc	1329.63	1.00	1329.63	14.85	*
Residual	91152.50	3655.83	24.93		

ANOVA TABLE FOR HIGH SES STUDENTS

Model	SS	DF	MS	F*	Sig
Race/Sex	494.58	2.00	247.29	2.61	
Prior Math	128683.08	1.00	128683.08	1358.66	*
AlgI	102.80	1.00	102.80	1.09	
Geom	2073.75	1.00	2073.75	21.90	*
AlgII	286.66	1.00	286.66	3.03	
Trig	1191.68	1.00	1191.68	12.58	*
Ccalc	6968.14	1.00	6968.14	73.57	*
Residual	108751.72	4122.12	26.38		

Note: ccalc combines pre-calculus and calculus: approximately 400 out of 1,460 students took both courses.
F* is adjusted for the design effect for sample to match population proportions. Sig =.05; fcrit=3.84 (1dF).

Table 5 displays the amount of explained variance in the final regression models for all students, low SES students, and high SES students. The change in R-square is the amount of variance in 12th grade math achievement scores explained by the variable(s) entered in that step. It measures the effects of the independent variables on the dependent variable. In all three tables, prior math achievement accounts for the greatest amount of explained variance. For all students, geometry contributes the greatest amount of explained variance of the five course variables. In the low SES models, algebra I, geometry, and algebra II contribute the most to 12th grade achievement scores. For the high SES models, calculus explains the greatest amount of variance in 12th grade achievement scores. Although minuscule, changes in R square are generally found to be significant. (Most likely due to a large sample size.)

TABLE 5
REGRESSION MODEL SUMMARY
Change in R Square Due to Course Variable

All students

Model	R	R Square	Change in R-sq	Sig.
Race/Sex	0.116	0.013	0.013	*
Prior Math	0.762	0.580	0.567	*
AlgI	0.765	0.586	0.005	*
Geom	0.778	0.605	0.019	*
AlgII	0.781	0.610	0.006	*
Trig	0.784	0.615	0.005	*
Ccalc	0.791	0.626	0.011	*

Low SES students

Model	R	R Square	Change in R-sq	Sig.
Race/Sex	0.107	0.010	0.010	*
Prior Math	0.640	0.410	0.400	*
AlgI	0.660	0.429	0.019	*
Geom	0.670	0.450	0.021	*
AlgII	0.680	0.470	0.020	*
Trig	0.690	0.470	0.000	
Ccalc	0.690	0.480	0.010	*

High SES students

Model	R	R Square	Change in R-sq	Sig.
Race/Sex	0.045	0.002	0.002	
Prior Math	0.721	0.520	0.518	*
AlgI	0.721	0.520	0.000	
Geom	0.727	0.528	0.008	*
AlgII	0.728	0.530	0.002	
Trig	0.731	0.534	0.004	*
Ccalc	0.750	0.562	0.028	*

*Note: ccalc combines pre-calculus and calculus: approximately 400 out of the total 1,460 took both courses. * = sig. at .05 alpha.*

DISCUSSION

The combined set of math courses explains 4.2% of variance in the 12th grade achievement scores. This finding is lower than other research findings (ACT &CGCS, 1998). The differences may be, in part, due to imputation of missing data, which reduces the variance that exists in the actual data set. Of the five courses, geometry contributed the most to 12th grade achievement scores, and algebra I had the smallest effect on the scores. Of the covariates, 8th grade achievement scores had the highest correlation with 12th grade achievement.

The correlations among the variables are significant. Often if the predictor variables are highly intercorrelated, the threat of multicollinearity exists. Multicollinearity affects the sampling variance of the standardized coefficients in the prediction equation. However, data sets with large sample sizes are generally much less sensitive to the effects of multicollinearity.

Consistent with the findings from the regression analyses, the highest correlation exists between prior math achievement and 12th grade math achievement: .76 (See Table 2). Geometry is highly correlated with algebra I and algebra II. The lowest correlations (although still significant) exist with algebra I: prior math achievement, trigonometry, calculus, and 12th grade math achievement.

The results of the course taking analysis suggest the following (Table 3):

- Approximately 22% of students who take algebra I will go on to take calculus in high school.
- For high SES students, 39% of students who take algebra I will go on to take calculus.
- For low SES students, approximately 8 % of students who take algebra I will go on to take calculus in high school.
- While 90% of high SES students move on to geometry after algebra I, only 53% of low SES students enroll in geometry after algebra I.

The differences in course-taking patterns between low SES students and high SES students are striking. The data are particularly troublesome considering the impact on math achievement scores. A 12-point gain in achievement scores can be realized when comparing low SES students who completed calculus and low SES students who took only algebra I. Low SES students who took algebra I, on the average, earned 4 points more than students who did not take algebra I. High SES students measured a 1-point difference between those who did take algebra I and those who did not take algebra I. The overall gain for high SES students who completed calculus when compared with those who completed only algebra I is 8 points. This data imply that the gains for low SES students can be much greater than those for high SES students.

Some courses did affect scores of one group differently than the other group. Low SES students benefited more from taking geometry and algebra II than trigonometry, whereas, high SES students gained more from geometry and trigonometry than from algebra II. This may be explained by differences in the quality of the courses taught at the different schools. Regardless of SES status, however, taking advanced math coursework early will help all students improve their math achievement scores, but low SES students have a greater opportunity for improvement than high SES students.

As previous research has indicated, math achievement gains are realized when rigorous math courses are taken: the more difficult the coursework, the greater the gain (ACT & CGCS, 1998). The results of this study show that the overall changes in R-square are somewhat low, but significant (See Table 5). For all groups of students, calculus (combined precalculus and calculus) improves on math achievement scores on the average by 3 points. Geometry also provides a large gain for all students. Geometry explains 2.2% of variance in 12th grade achievement scores, while algebra I, algebra II and calculus add 1% each. Trigonometry fared modestly (but significantly) among the coursework variables.

Consistent with other findings in this study, the amount of explained variance from coursework differed for low SES and high SES students. Low SES students realize the greatest gains from the algebra I, geometry, and algebra II sequence, while high SES students realize the greatest gains from calculus.

CONCLUSION

The purpose of this research is to examine the relationship between math course-taking patterns and 12th grade math achievement scores for all students in the sample and for low and high SES groups separately. The most surprising results show that low SES students have the potential for greater gain than high SES students when taking more rigorous math coursework. Although the gap continues to exist, it does narrow as students take more match coursework.

The analysis identifies courses that students are likely to take and how those course-taking patterns affect math achievement. Taking advanced math courses contributes significantly to math achievement scores - even after adjusting for differences in race, sex, and prior math achievement. The fact that prior math achievement is highly correlated with 12th grade math achievement and explains a significant amount of variance implies that math achievement begins before students enter high school. Gains in math achievement are realized for all students, regardless of socio-economic status, but specifically for students who take geometry and calculus.

This research has implications for policy makers and curriculum developers, particularly for poorer school districts. Curriculum developers can offer more courses that are shown to improve achievement, providing students with more opportunities to benefit from rigorous coursework. Policy-makers may require all students, particularly students in low SES area, to complete a rigorous math course sequence as part of the general high school requirements. Clearly opportunities exist for poorer students to improve math performance and benefit from greater success later in life by changing course-taking patterns.

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USING CLUSTER ANALYSIS FOR TRANSCRIPT ANALYSIS OF COURSE-TAKING PATTERNS

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Until recently, Community College of Philadelphia (CCP) offered to its students an Associate's in General Studies degree. Over thirty percent of its associate degree recipients over a recent ten-year period graduated through this curriculum (Annual Statistical Compendium, 1995). Requirements for graduation included the completion of three English courses, one additional humanities elective, two social science electives, two Science/Math electives and twelve free electives. Because of the variety of courses available to students in this curriculum, it was difficult to understand completely the nature of the course choices made by General Studies graduates.

While the reasons a student chose to enroll in a particular mix of courses might have been known to the student, and perhaps to his or her advisor, and those reasons might have been firmly based in the most sound pedagogical reasoning, the college did not systematically attempt to understand or learn from the patterns of enrollment displayed by its General Studies graduates. This was unfortunate because the college missed out on an opportunity to learn from its students what they wanted from the college that was not otherwise offered by its more structured curricula.

There was a specific need to know more about the following issues:

1) Is there a common set of courses taken by all General Studies graduates? Does a core curriculum exist for this program? Are these graduates systematically avoiding some courses and taking others?
2) Are General Studies graduates completing second-level courses, or are they completing only introductory courses? Is there a balance between breadth of studies and depth of study?
3) Outside of the common core of courses, are there patterns in the course-taking of the General Studies graduates? Are there distinguishable subsets of graduates, with unique patterns of study? Do these patterns make sense, i.e., are they clearly directed towards transfer or a career of some sort?

Typically, questions of this sort have been answered through the use of transcript analysis. Transcripts are completely objective and unobtrusive measures. Although they do not record information about out-of-classroom experiences, attitudes, and commitments, they do give us an accurate accounting of the courses, grades, and degrees a student completes (Adelman, 1992, 1995). The process of transcript analysis traditionally has been a manual one and is costly, time-consuming, and subject to biases of sampling and of those people sorting through the assembled transcripts.

Adelman (1990, 1992, 1995) made use of two national databases of transcript

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information to detail what was studied and where by graduates of the high school classes of 1972 and 1982. These studies were undertaken to better understand the different curricular experiences of students at various types of institutions, and how those experiences changed over time. While Adelman's work provides a detailed descriptive look at the individual courses and degrees completed by two cohorts of students, it does not provide us with information about the combinations of courses taken by any group of students. Adelman's approach can be used to provide answers to the first two research questions, but does not address the issue of patterns raised in the third research question.

A different way to approach this question is through the use of cluster analysis. This technique makes it possible to reduce a very large body of data to a relatively compact description (Anderberg, 1973). In the college setting, it has been used by student counseling professionals to more efficiently target programming (Jones & Pinkney, 1991) and by researchers to link specific patterns of coursework to learning achieved (Ratcliff, 1992).

In their book, *Principles of Numerical Taxonomy*, Sokal and Sneath (cited in Aldenderfer & Blashfield) argued that cluster analysis could be used to place relatively similar organisms into groups and these groups could be analyzed to determine if they represented biological species. In much the same way, the course-taking patterns of students can be clustered and then analyzed to determine if they represent some sort of informal curricular structure.

Different clustering methods can generate different solutions to the same data set (Aldenderfer & Blashfield, 1984). Anderberg (1973) cited this as a strength of the technique. A single classification may give a distorted view of a multifaceted data set. There may in fact be many meaningful groupings and a variety of cluster analysis techniques will be needed to reveal them. Everitt (1993) wrote:

> A variety of alternative classifications for the same set of objects or individuals will always exist. Some classifications will be more useful than others....The important point is that any classification is a division of the objects or individuals into groups based on a set of rules - it is neither true nor false (unlike say a theory) and should be judged largely on the usefulness of the results. (p. 3 - 4)
>
> In many applications it might be reasonable to apply a number of clustering methods. If all produce similar solutions, the investigator might perhaps have more confidence that the results are worthy of further investigation. Widely different solutions might be taken as evidence against any clear-cut cluster structure. Comparison of different classifications is clearly of some importance here. (p. 141-142)

Procedure

Data Acquisition and Preparation

I requested the following data from the CCP Computer Center for all students who graduated with an A.G.S. degree between Fall 1984 and Spring 1992:

Student I.D. number
Entering year and term
Entering curriculum
Final year and term
Final curriculum
Number of semesters attended
First year and term with credit
Department and course number of each course enrolled in (maximum of 50 courses)
Grade for each course enrolled in

Records for 1957 A.G.S. graduates were returned by the Computer Center. All records were examined for the presence of failed courses and duplicate courses. All failed courses and all but the final occurrence of duplicate courses were eliminated from the analysis because these courses do not carry credit towards graduation.

Each graduate's course-taking history was analyzed to determine if they successfully completed 80% or more of the required core courses for any of the 60 defined curricula of the college. This was done to remove them from further analysis since the stated purpose of the study was to determine the underlying curricular structures of graduates' course-taking patterns. If students "shadow" another of the college's curricula, their course-taking patterns are already understood. It is economical and relatively riskless to remove from the data set those with obvious patterns as they are found and concentrate on the remaining, more confused residue (Anderberg, 1973). This process eliminated 92 graduates from the analysis.

Similarity Coefficient and Clustering Techniques

The variables used for comparisons of all remaining graduates were completed courses. Jaccard's coefficient was calculated for all pairwise combinations of graduates. This measure was used because it gives no weight to joint absences. When the simple matching coefficient is used, some cases appear very similar primarily because they both lack the same features rather than because the features they do have are shared. In contrast, Jaccard's coefficient is concerned only with features that have positive co-occurrences (Aldenderfer & Blashfield, 1984). It might be unreasonable to consider two individuals as very similar simply because they both lack a large number of qualities (Everitt, 1993). Students may enroll in any of the nearly 700 courses offered by the college, and graduates need to complete less than 30 courses in order to qualify for graduation. It makes little sense in this case to give equal weight to the 650 or so courses that a pair of graduates jointly did not take as it does to the 50 or so courses they did take.

Graduates were cluster analyzed using a variety of clustering methods in SPSS for Windows Release 7.0. Hands and Everitt (1981) suggested that Ward's method was the best at recovering true cluster structure on a data set of the type employed in this study when the data contained approximately equally sized clusters, but centroid clustering was superior when the clusters were of different sizes. Since there was no reason to suspect the clusters under investigation were more likely to be of equal sizes than unequal sizes, nor vice-versa, both of these hierarchical agglomerative methods were employed.

Milligan's findings (cited in Aldenderfer & Blashfield, 1984) suggested that *k*-means clustering, using an initial starting partition derived from average linkage clustering, should also be examined. Therefore, the K-Means Cluster Analysis routine in SPSS was employed with initial cluster centers derived from the average linkage between groups method. This clustering routine was employed for all solutions ranging from the 2-cluster solution to the 50-cluster solution.

Assessing Clustering Solutions

Although a number of heuristic procedures and formal tests have been developed for determining the "optimal" number of clusters, each of these procedures is marked by reliance on subjective decisions by the researcher (Aldenderfer & Blashfield, 1984; Everitt, 1993), or require the analyst to defer judgement to the computer (Anderberg, 1973). Anderberg argued that:

> It is comforting to formulate the problem as a search for optimality because when the solution is found it can be eagerly adopted without further ado....An alternative to optimality is to use heuristics and intuition to find solutions "by inspection."...[This] approach enhances the efficacy of subjective judgement rather than surrendering to a completely specified procedure before the first candidate solutions are seen. Rather than remove human judgement altogether, the idea is to focus judgement on plausible alternatives. (p. 24).

For purposes of this analysis, the optimal solution for each method was one that provided a number of large clusters to investigate while simultaneously accounting for as many graduates in the sample as possible. A minimum cluster size of 40 members was chosen because it allows for an average of five graduates a year for each of the eight years of the study. It can be argued that a program of study that on average provides five graduates a year to the college is both vital and viable. I decided that the large clusters for each method should account for at least 75 percent of all graduates. I felt that allowing more that one-quarter of the sample to fall into small, unexamined clusters would lessen the utility of a solution. The solution selected for each method can be seen as an attempt to strike a balance between the desire to maximize the number of large clusters and the need to minimize the loss of students accounted for by those clusters.

For each of the three relevant clustering methods, cluster memberships for each subject were saved for all solutions ranging from the 2-cluster solution to the 50-cluster solution. Tables were then developed for each clustering method showing cluster frequencies for each of the 49 different solutions. For each solution, the number of clusters with at least 40 members was calculated, as well as the total number of graduates and percentage of the overall sample that these large clusters accounted for. These tables were used to determine the most useful solution for each clustering method.

Comparing and Profiling Classifications

Once the clusters for each solution were assigned, they were compared to the clusters assigned by the other methods to determine the overlap on clusters. A three-way crosstabulation of the cluster memberships was calculated for this purpose. In the present case, those graduates who were identified as members of the same group by all three methods were considered first for further analysis. This was done by examining the cells of the crosstabulation and choosing those groups large enough to be considered useful. Once again, 40 members was chosen as the minimum group size.

This method did not account for all large clusters from the three clustering solutions initially chosen. Therefore, the 3 two-way crosstabulations of the cluster solutions were examined for those clusters not represented in the three-way analysis. This yielded additional groups for analysis, but once again did not account for all large clusters. These remaining clusters were examined on their own merits. This means of choosing groups for analysis may seem roundabout, but Anderberg (1973) argued:

> The clusters are not interesting in themselves at all; the point of interest is in inferences about the structure of the data....This explanatory structure is the object of the search.....Once a satisfactory structure is known and defended on its own merits, any cluster analysis that contributed to its discovery is only of historical significance. (p. 19)

Each group of graduates was profiled as to their most frequently completed courses. This was done both for General Studies graduates in general and for all groups identified through the above procedures. Groups were also profiled on number of transfer credits, years of enrollment, and final curriculum. These profiles were used to draw inferences about the intent of those graduates in each group.

Results

Choosing Cluster Solutions

Ward's method provided the easiest choice between cluster solutions given the selection criteria. Because the tendency of this method is to create approximately equally sized clusters, it was possible to select the 11-cluster solution and still account for 100% of the graduates. This provided a fair number of clusters to investigate and had the added benefit of accounting for the entire population.

For the centroid method, the 42-cluster solution provided the maximum number of large clusters while still accounting for at least 75% of the graduates. Although it would have been possible to account for more of the graduates by selecting a solution with fewer large clusters, I decided to maximize the number of clusters rather than minimize the loss of graduates accounted for. This was done because all graduates had already been assigned to one of the 11 large clusters of Ward's method. This solution provided seven large clusters that accounted for 79.9% of the graduates.

Three candidate solutions were examined for the *k*-means method: (a) the 31-cluster solution, with 9 large clusters accounting for 95.3% of the population; (b) the 33-cluster solution, with 10 large clusters accounting for 95.1% of the population; and (c) the 50-cluster solution, with 14 large clusters accounting for 93.1% of the population. When the large clusters from the 31-cluster solution were used in the three-way crosstabulation, more graduates were collected together in the large groups formed in the cells of the crosstabulation, and fewer of its clusters failed to enter into one of the large groups than did the clusters formed by the other two *k*-means solutions. For these reasons, the 31-

cluster solution was used for all further analyses.

Comparing Classifications

The three-way crosstabulation of classifications yielded 12 groups of 40 or more graduates. These 12 groups accounted for 1029 (55.2%) of the 1865 graduates analyzed. Of the 7 large clusters identified by the centroid method, 6 were included in at least one of the 12 groups identified; 10 of the 11 large clusters identified by Ward's method were included in one of the groups; and 7 of the 9 large clusters from the *k*-means analysis were included in one of the 12 groups.

The 3 two-way crosstabulations yielded four more groups. Unlike the groups formed by the three-way crosstabulation, membership in one of these four groups did not preclude membership in one of the remaining three groups. Twenty-seven graduates appeared in three of the groups, and 7 graduates appeared in two groups. Once the overlap across groups was factored out, these groups accounted for an additional 209 graduates. The two large clusters from the *k*-means analysis that were not included in any of the groups of the three-way crosstabulation were used here, however there remained one large cluster each from both of the hierarchical analyses which had not yet entered into any of the 16 groups identified.

Table 4

Cluster Memberships for Analyzed Groups

		Cluster number		
Group	N	Centroid method 42-cluster solution	Ward's method 11-cluster solution	*k*-means method 31-cluster solution
		Groups identified by three methods		
1	92	1	1	5
2	59	1	1	11
3	153	1	1	19
4	54	1	2	11
5	56	1	10	5
6	166	2	3	10
7	41	3	4	1
8	154	4	5	1
9	80	4	6	1
10	58	4	8	1
11	70	8	7	3
12	46	11	9	17
		Groups identified by two methods		
13	83	2	2	
14	53	2		21
15	61		2	2
16	73		2	21
		Groups identified by one method		
17	43	7		
18	40		11	

These two clusters were considered groups in their own right. The 40 graduates who were identified by the remaining Ward's method cluster had not been identified as members of any of the other earlier defined groups, but 34 of the 43 graduates in the remaining centroid method cluster had membership in the groups identified by the two-way crosstabulations. Over 70% of the graduates either were set aside from further analysis or entered at least one of the groups identified (see Table 1).

Profiling Groups

The 18 groups identified are presented here in decreasing order of the apparentness of their course-taking patterns. Many of the groups appear to have similar types of interests and are therefore presented together.

Groups 7, 8, 9, and 10 all had clear health career interests. Members of these groups tended to complete several biology courses, and many completed chemistry courses. The nursing curriculum was the one in which they were most likely to have completed the greatest percentage of course requirements. Other Allied Health programs were also represented in these course taking patterns, but not to the same extent.

Members of Group 12 were likely to take chemistry, biology, and physics courses, but unlike those in Groups 7 through 10, they were likely to have completed the greatest percentage of course requirements of the chemical technology curriculum. This combination of courses and curricular interest possibly indicate an interest in further studies in pharmacy.

The most popular courses for those graduates in Group 11 have an international emphasis: World Literature I & II, World Civilization I & II, World Religions, The Individual in the World, Elementary Spanish, Elementary French, and Cultural Anthropology. Each of these courses was completed by 90 % or more of the members of this group. Of the 70 members of this group, 63 completed more of the requirements of the pre-education curriculum than they did of any other curricular offering of the college.

Group 18 similarly appeared to have a core set of courses that were taken by the majority of group members. All members of this group took the six most popular courses, and the two next most popular courses were taken by 98 % of the group. Amongst these eight courses there was an advanced literature course, a course in American culture, and a philosophy course. This pattern corresponds to the courses generally taken by those students who participate in the honors program of the college, a program directed towards transfer to a four-year college.

Groups 6, 13, 14, 15, 16, and 17 had apparent business interests, and these interests took several forms. In Groups 15 and 17, 12 of the 50 most popular courses were office administration offerings. Introductory data processing and introductory accounting courses were likewise popular with these two groups. Those in Group 6 were more likely to be enrolled in marketing, management, accounting, and economics courses than those in other groups. Group 16 members tended to complete more computer-related program requirements than other program requirements. Groups 13 and 14 took courses from throughout the various business offerings, but did not concentrate their efforts to quite the same degree as did those in the other groups.

The pre-education program was overwhelmingly the program in which the greatest percentage of course requirements were completed for Groups 1 and 5. The members of these two groups on average completed fewer courses with prerequisites than did members of any of the other groups.

Members of Groups 2, 3, and 4 had varied curricular interests as evidenced by the variety of curricula in which they completed the greatest percentage of course requirements. They were as likely to have completed these requirements in a social services program as in a business or education program. There is no immediately apparent core set of courses for these groups. The few courses that were popular with these groups were introductory courses spread over various content areas and were the same courses popular with all General Studies graduates, regardless of group.

Discussion

There was no typical pattern of course-taking for the overall population of General Studies graduates. That being said, there also were a number of graduates whose studies had a clear pattern to them. In this study, four identifiable course-taking patterns were evident.

"Shadowing" of Restricted Enrollment Curricula

Many students are unable to gain admission to their first choice curriculum. Because of the high costs associated with the programs in Allied Health, the college accepts only a fraction of the students who apply to these programs. In an attempt to avoid oversaturation of the market, and in order to make the practicum placement process a more manageable one, the college limits enrollments in other programs, such as Early Childhood Education. Although some students get shut out from these select curricula, they do not abandon study in these areas.

For example, those General Studies graduates who closely followed a pattern of study usually associated with Allied Health curricula very often had a final curriculum code indicating they either were waiting to get into an Allied Health curriculum, or had already been in one. Their course selections reflected their desire to graduate from one of these programs. These students either (a) failed to qualify for admission to the program of their choice; (b) were at some point admitted to their desired program, but could not complete the requisite course of study; or (c) changed their mind about gaining admission to a particular program, but only after shadowing its curricular requirements for a period of time. Although they were unable to complete all the requirements for graduation from one of the Allied Health curricula, they were able to complete most of the coursework and still maintain eligibility for graduation from the General Studies curriculum.

Like the Allied Health curricula, enrollments in Early Childhood Education are restricted. And just like those who patterned their course selections after Allied Health curricula requirements, failure to gain admission to Early Childhood Education (or failure in one of its required courses once admission had been gained) did not prevent these students from pursuing the course of study they desired. This refusal to abandon a chosen course of study is one of the ways students use the institution in what Adelman (1992) referred to as "making their own history." Despite the roadblocks constructed by the college and paths leading away from their intended course of study, these students would not be deterred.

Shadowing of Business Curricula

Finding an explanation for the shadowing of the business curricula of the college presents a more difficult problem. These programs are open access, but there are reasons a student might prefer to graduate through General Studies rather than a business curriculum. If the student intends to transfer to another college, specific courses required by a more structured curriculum might not transfer. In order to minimize loss of credits then, the savvy student will take all the courses that transfer easily, and fill in with electives. The General Studies curriculum was very accommodating of this practice. The College recognized this practice, and put in place business transfer curricula tailored to those colleges to which its students were most likely to transfer.

Another reason a student might have elected the General Studies route was to avoid a difficult required course. This is the type of practice that can be best observed and remediated by an advisor working one-on-one with an individual and his or her transcript. The advisor must be able to sense which curriculum most closely matches an advisee's course-taking to that point and encourage full participation in that curriculum.

Novel Course-Taking Patterns

There were a number of graduates whose course-taking patterns did not reflect the requirements of any of the defined programs of the college. Instead, these students took a collection of courses that had personal relevance. One group surveyed the college's offerings in world civilizations and cultures. A second group appears to have been concentrating their studies in courses offered in the honors program of the college. A third group took a number of biology, chemistry, and physics courses while completing the greatest percentage of course requirements in the chemical technology curriculum. According to a member of the chemistry faculty at Community College of Philadelphia, many of these students continue their studies in pharmacy.

The course-taking patterns of these students should be telling the college something. While some of their peers were taking courses that did not yield an immediately apparent pattern, the three groups described above took courses arranged around an educational core. These cores did not shadow another curriculum of the college and therefore should be seen as an opportunity for the college to offer to its students a program of studies which is both educationally sound and in obvious demand.

Unfocused "Patterns"

The college must redouble its efforts to understand the educational intent of those whose course-taking did not yield a recognizable pattern. Absent the ability to find the structure underlying the course selections of these students, the relationship between the courses they were enrolled in and stated outcomes for their program would be difficult, if not impossible, to demonstrate. The degree the college confers upon these students must be as meaningful to the college as any of the other degrees it awards. The tendering of a degree should not be automatic upon the completion of a required minimum number of credits but rather confirmation that an acceptable program of study has been completed.

Conclusions

Cluster analysis techniques are useful in the search for course-taking patterns, but the method has its limitations. As Aldenderfer and Blashfield (1984) and Anderberg (1973) cautioned, clustering methods always place objects into groups, and these groups may be "real" or merely an artifact of the measures and methods employed for a given analysis. There is a human art to making meaning of the groups the techniques uncover.

Although this study concerned graduates of the General Studies curriculum at Community College of Philadelphia, in no way is the technique limited to that population. It can be used to reveal patterns of course-taking within more structured curricula, and it can be used at high schools, four-year colleges, and graduate schools as well. To the extent that elective coursework is allowed, students will use the freedom accorded to them to bend the curriculum in many unanticipated ways. Faculty and administrators should seize the opportunity to learn from the patterns evident in the course-taking of their students, and to ensure the educational quality of the collection of courses in which their students ultimately enroll.

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FROM DATABASE TO DATA WAREHOUSE

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The original problem

In the mid-1980's, the academic audit process at Community College of Philadelphia (CCP) was beginning to settle into a set of somewhat predictable patterns. Those programs identified for audit would come to the Office of Institutional Research with requests for information needed for the completion of the audit. In almost all cases, the requests were for the same core set of information. Every year would see about five new programs added to the list of those actively conducting audits. Most audits took more than a year to complete, so there was a need to provide updated information to many programs each year. Additionally, faculty and staff from other areas of the college would show up in the office with requests that began to fit their own predictable patterns. It became obvious that providing customized information for each of these requests was an unmanageable way of doing business and a search for a reasonable solution began.

The data elements that were at the core of the majority of requests became the logical starting point for structuring the database we planned to put together. Almost all programs under audit were interested in some key demographics of their students—age, race, gender, and geographic area of the city the student resided in, among others. There was usually interest in a similar set of "input" variables—placement test scores, entering developmental/remedial status, high school attended, etc. There was, of course, interest in the "process" variables—e.g., curriculum enrolled in, retention patterns, participation in educational support programs, campus attended, full-time/part-time status. None of the evaluations would have been complete without the standard "outcome" variables—GPA, credit hours earned, graduation status, academic probation status.

The solution

What we had then was a list of variables, some which were static (e.g., race and gender) and others that would either change (e.g., cumulative GPA) or take on new values (e.g., semester GPA) with the passage of time. It was clear that there would be two parts to the database: the "static" demographic portion and a "dynamic" semester-by-semester portion. Over time, the importance of collecting certain information, which to that point had not been collected, became apparent, and those data elements were added to the database. As each semester passed, the semester portion of the database required updating. New information was appended to the end of each existing record, and new records were added to the database. Soon we had a large database, with lots of information, but we came to realize that it was difficult to manage in its originally conceived form.

Data elements on the database specification[1]

Demographic record

- Social Security number
- Race
- Gender
- Birth year
- ZIP code
- Certificate curriculum, year & term awarded
- Associate's curriculum, year & term awarded
- *English 101grade, year & term completed*
- *English 102 grade, year & term completed*
- *English 112 grade, year & term completed*
- Reading test score
- Writing test score
- Math test scores (old form)
- *Math test scores (new form)*
- Test waiver code
- Previous college indicator
- Credits transferred in
- Credits by exam
- High School code
- High School graduation year
- First year and term enrolled at the college
- *First year and term attempted credit courses at the college*

Semester record

- Social Security number
- Semester (year and term)
- Curriculum code
- Session (Day, evening, weekend, etc.)
- Full-time/Part-time status
- Educational Support Service enrolled in
- Credits withdrew from during semester
- *Regional Center indicator*
- Financial aid indicator
- Semester hours attempted (credit hours only)
- Semester hours earned (credit hours only)
- Semester GPA
- Semester registered hours (includes developmental courses)
- Cumulative hours attempted (credit hours only)
- Cumulative hours earned (credit hours only)
- Cumulative GPA
- *Cumulative registered hours (includes developmental courses)*
- Probationary status
- Clock hours (includes non-credit and developmental courses)
- *Residency code*
- *Business and Industry code*
- *Community Services room*

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[1] Data elements appearing in *italics* were added to the file at various points and were not present in the first version of the database specification.

Community Services curriculum

Original structure of the file

The original specification for the file called for a single record to be entered on the database for each student (see Figure 1). This longitudinal record consisted of a demographic block at the front with all the information about a student that would not change over time, or could take on only one value of interest (e.g., English 101 grade from the most recent attempt at the course). Attached to the back end of this block were semester "buckets". These buckets were filled with the same information for each semester of a student's attendance. If a student did not attend for one of the semesters for which a bucket had been allocated, an empty bucket was placed in the record. This was necessary because the position of the bucket in the record was the indicator of which semester's information was being examined. As each new semester was added to the database, a new bucket was simply appended to each student's record. By the time ten years of data were available on the database, there were 40 buckets (4 semesters per year x 10 years). Most of these buckets were empty for most of the students. A second problem crept up when a new piece of information had to be added to the demographic block or to each semester's bucket—it forced all information in following semesters to shift to the right, and all the data list statements for our SPSS code had to be modified to account for this change, as did all our QUIKJOB code. A new approach was indicated.

Current structure of the file

The rectangular, case-ordered structure of the original file proved to be too inefficient and too difficult to update. Fortunately, data file structures are not limited to that simple approach. SPSS supports complex, non-rectangular files. The solution we decided upon was to build one of those file types, a nested data file. Files of this type contain various record types with a hierarchical relationship among the record types. A record of one type may have its information distributed across records of other types. This file type allows us to build a set of records for each student, with the demographic information being one of those records, and each semester of attendance having a record of its own (see Figure 2). The demographic information can be distributed across each semester's worth of information, and analysis can proceed from there. This database structure eliminates the waste of empty buckets, and allows for the efficient addition of new information to each record—it can simply be appended to the end of each record without affecting the information in each following semester for that student.

Emerging issues

The broader-than-anticipated use of the data puts issues on the table that were not part of the original design criteria for the database. In addition to the more generalized use the Office of Institutional Research has found for the file, other administrative units of the College access the data contained in it rather than the primary sources they previously used. This has presented the following challenges:

a) The importance of fully operationalizing all definitions of the elements used in the data file. When access to the file is no longer restricted to those who came together to design it, it is imperative that a common understanding of what the individual elements represent be agreed upon, and that understanding must be based upon objective standards acceptable to all parties.

b) Defining who has the responsibility for the necessary validity and reliability checks. If the data in the warehouse are retrieved from other administrative areas of the college, who should check for inconsistencies in the data? Who should change the data, and should those changes ripple back through the system to the files they were created from?

c) The creation of our data warehouse has fundamentally changed the nature of the relationship of the Office to the Computer Center. The implications of this change have effected the operations of the Office, both in terms of the types of information we now request from the Computer Center and in the ways data is analyzed.

Figure 1

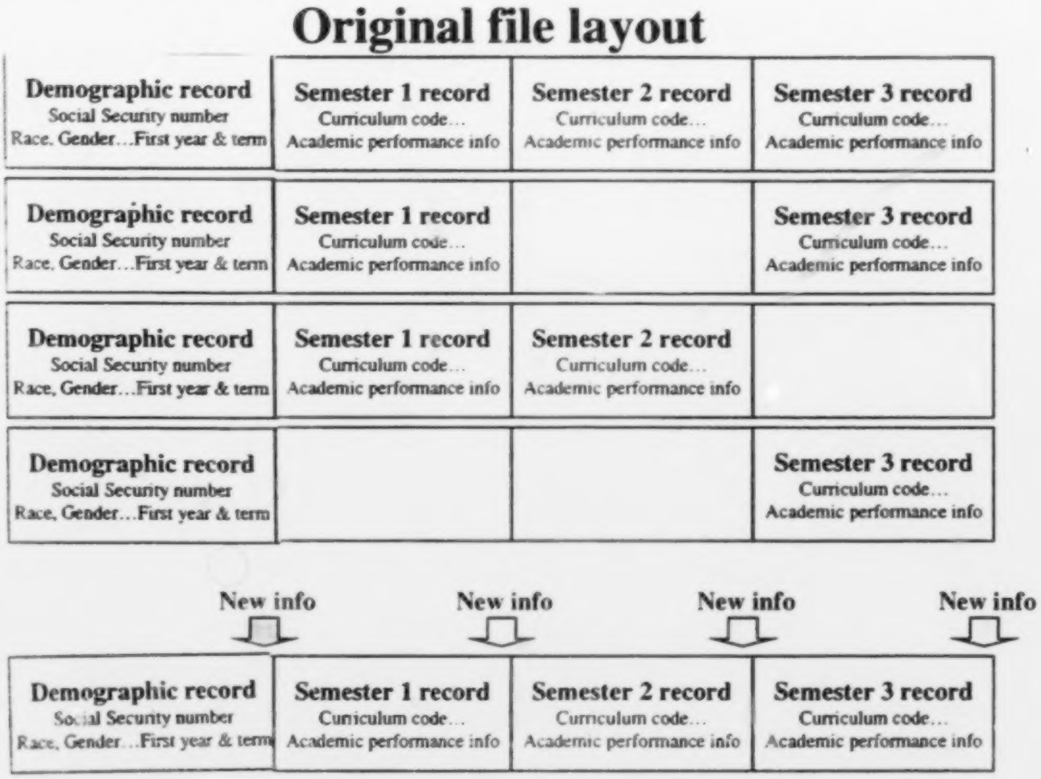
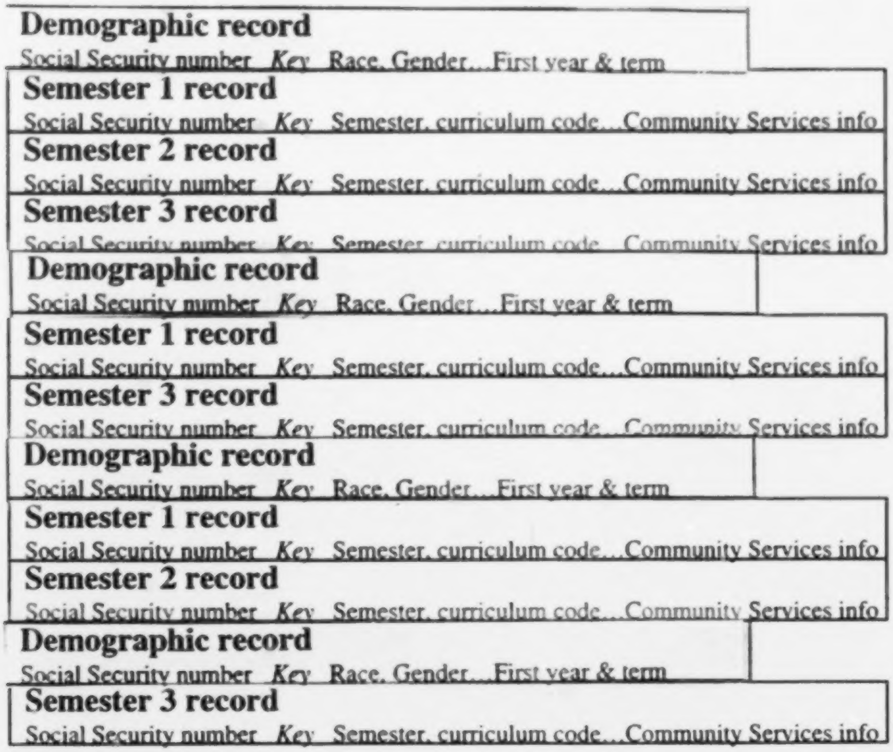
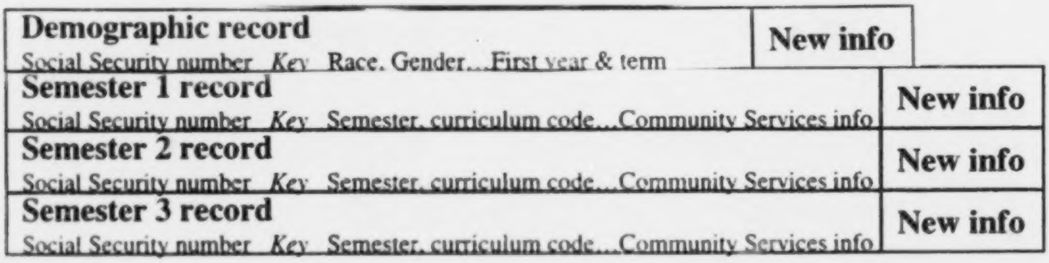


Figure 2

Current file layout


Demographic record
Social Security number Key Race, Gender…First year & term
Semester 1 record
Social Security number Key Semester, curriculum code…Community Services info
Semester 2 record
Social Security number Key Semester, curriculum code…Community Services info
Semester 3 record
Social Security number Key Semester, curriculum code…Community Services info
Demographic record
Social Security number Key Race, Gender…First year & term
Semester 1 record
Social Security number Key Semester, curriculum code…Community Services info
Semester 3 record
Social Security number Key Semester, curriculum code…Community Services info
Demographic record
Social Security number Key Race, Gender…First year & term
Semester 1 record
Social Security number Key Semester, curriculum code…Community Services info
Semester 2 record
Social Security number Key Semester, curriculum code…Community Services info
Demographic record
Social Security number Key Race, Gender…First year & term
Semester 3 record
Social Security number Key Semester, curriculum code…Community Services info


Demographic record
Social Security number Key Race, Gender…First year & term
New info
Semester 1 record
Social Security number Key Semester, curriculum code…Community Services info
New info
Semester 2 record
Social Security number Key Semester, curriculum code…Community Services info
New info
Semester 3 record
Social Security number Key Semester, curriculum code…Community Services info
New info

THEY'LL SURF BUT THEY WON'T SWIM: STUDENT RELUCTANCE TO APPLY TO COLLEGE ONLINE AND IMPLICATIONS FOR WEB-BASED SURVEY RESEARCH

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Access to computers and the Internet has dramatically increased among college-bound students during the past few years. With this in mind, many college admissions professionals have begun to place college applications on the Internet (and in the case of the MIT Sloan School of Management, *require* students to apply on-line). Even with such technological advances that should make the application process easier and more convenient for all parties involved, student response to non-mandatory Web-based college applications has been lackluster at best. Why?

The present study seeks to answer that question and shed light on many of the issues and concerns surrounding Internet-based inquiry in an institutional setting. Specifically, this study examines (1) how college freshmen use their computers and the Internet, and (2) the reasons why students are reluctant to use the WWW to apply to college. Because the Internet is a fairly new information medium and growing at such and extraordinary pace, little timely research exists that documents student usage patterns. Thus, this study uses information about how the current cohort of incoming freshmen is using computers and the Internet as a framework to examine their reluctance to apply to college online. Implications based on the findings are discussed in terms of both the college application process and Internet-based survey research.

Background

A recent national study by the Art & Science Group showed that more than three out of four college-bound high school students (78 %) used campus Web sites while applying to college last fall, up from 58 % in 1997 and a mere 4% in 1996 (Academe Today, 1998). Most "surfed" the Internet to gather information about prospective colleges and universities. Fully realizing that the current generation of potential applicants is the most Internet-savvy to date, admissions offices and software companies have eagerly attempted to take advantage of this boom in Internet use among the college applicant population. This is evidenced by the proliferation of college admissions Web pages designed to aid the college search process and equipped to handle online applications (see Academe Today, October, 1998).

While online applications aim to ease the application process by reducing the workload for both students and admissions offices, both technological and perceptual obstacles have resulted the lackluster acceptance of online applications. The Art & Science Group study found that print catalogs are still the most important sources of information for college-bound students, and the same is true for traditional pen-and-paper applications. Their survey of 500 college-bound high school seniors showed that only 21% preferred on-line college applications, down from 34% in 1997. The present study uses a large multi-institutional sample of college freshmen to take a closer look at Internet usage as well as the reasons *why* students are reluctant to apply to college online.

Data and Sample

Data used in this study were drawn from three surveys administered to separate groups of students who expressed interest in a top-ranked private liberal arts university in Spring, 1998. The first group surveyed consisted of students who inquired about admission to the university, but who did not subsequently send in an application

(N=1,117). The second group was made up students who applied, were accepted, and chose *not* to attend the university (N=980). The third group consisted of applicants who were accepted and who chose to attend the university in fall, 1998 (N=893). Thus, the 2,990 responses represent entering freshmen who were accepted at a variety of colleges and universities across the country. All respondents were asked specific questions about their computer and Internet use, and their concerns about applying to college electronically.

There were no statistically significant differences between the three groups of respondents used for this study. White respondents constituted 62.2% of the overall sample, followed by Asian Americans (13.7%), Hispanics (7.3%), African Americans (5.7%) and Native Americans (0.2%). The rest of the sample (10.8%) marked "other" as their race or ethnicity. Women and men were fairly evenly divided with respect to the college population with 41.2% of the respondents male, and 58.8% female (national college populations are approximately 45% male and 55% female on average).

Slightly more than half of the students in the sample came from public high schools (57.5%), while 35.5% attended private high schools, and 7% marked their high school type as "other". Consistent with the high-achieving students who are attracted to top-ranked institutions, almost all (97.1%) aspired to a graduate degree. Many came from financially secure backgrounds as well—fewer than one in five students (18.3%) expressed concern about their ability to pay for a college education.

Results

Student Internet Access

Almost all the students surveyed (96.4%) had access to the Internet. This is not surprising, given that the factors most predictive of computer ownership and on-line access are family income and education. People with a college education are *ten times* as likely to own a computer compared to those without any high school (McConnaughey & Lader, 1997). Since parental college education is also a major determinant of college attendance for their children (Astin, 1993), it follows that the students who plan to attend college and express interest in high-ranked institutions most likely come from families who own computers and have on-line access.

This was shown to be the case in this study. More than three out of four respondents had Internet access at home (85.2%), which is *four times* higher than the national average of 18.6%, and more than *twice* that of households where parents have a bachelor's degree or above (38.4%)[1] ((McConnaughey & Lader, 1997). A large percentage of students (86.6%) had Internet access at school. Just over half (54.6%) had access at their library, and 32.6% had Internet access at their parent's place of work.

Interesting differences begin to emerge when access to the Internet is examined by race. Not surprisingly, White and Asian American students have significantly more access to the Internet from home than do African American and Hispanic students (see Figure 1). This is consistent with the findings from a recent report by the National

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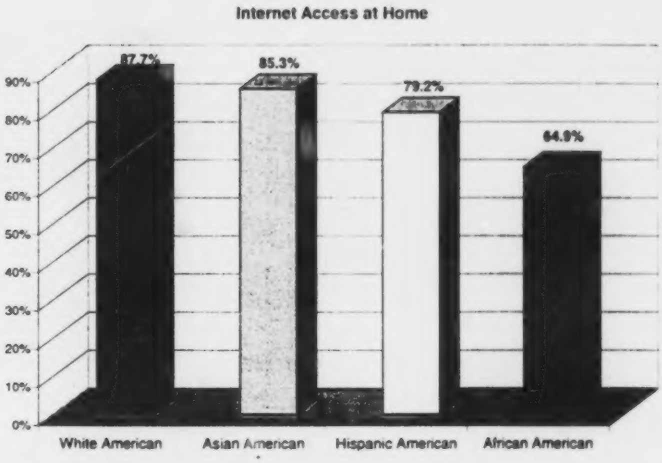
[1] These percentages vary due to rural or urban status, income, state, age of householders, and household type.

Telecommunications and Information Administration (1997) which showed that even at incomes higher than $75,000, whites are significantly more likely to own computers than are African Americans and Hispanics. Even more disturbing is the finding that at the same income level, the rates of on-line Internet access nationally are nearly *three times* as high for whites (21.2%) as for African Americans (7.7%), or Hispanics (8.7%) (McConnaughey & Lader, 1997).

Figure 1.
Internet Access at Home by Race



Computer and Internet Usage Patterns[2]

For what specific tasks are college-bound students using their computers, and what are they doing online? Figure 2 shows that computers are being used most for word processing (98.2%) and Internet "surfing" (96.1%), followed by email (89.9%), video games (58.7%), art or graphics (50.7%), Internet discussion groups (22.1%), and shopping online (10.8%). Even though almost two of three students (62.4%) reported using the Internet to download college materials, only 16.3% reporting using the Internet to *submit* college applications.

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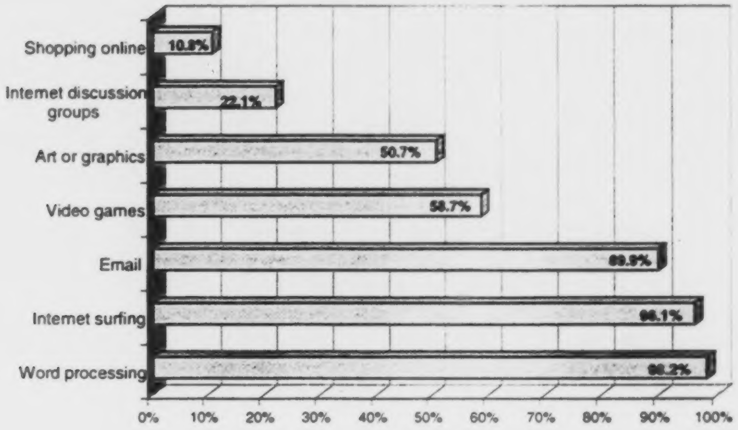
[2] These questions were only asked in two of three of the groups surveyed. N=1,873.

Figure 2.
Computer Usage



Interestingly, differences begin to emerge--particularly in applications that are Internet-based--when women and men are viewed separately (see Table 1). Men are significantly more likely than women to report frequent use of the Internet (71.3% compared to 57.8% of women—a 13.5% difference). They also report more frequent use of Internet discussion groups (6.1% for men versus 2.8% for women), downloading college information (14.3% for men, 13.9% for women), and submitting college materials (3.7% compared with 2.3% among women). Interestingly, in a surprising reversal of gender stereotyping, freshman men reported shopping online *twice as much* as did women (1.7% of men compared to only 0.6% of women reported shopping online "frequently", and 14.8% of men and 7.6% of women said they shopped online "frequently" or "occasionally"). Men are also more likely to use computers for video games (35.2% compared to only 6.9% of women). The results from this sample of college freshmen with respect to video game usage is consistent with national findings from the 1997 CIRP Freshman Survey which showed that men are significantly more likely to use computers for video games than are women (Sax, Astin, Korn, & Mahoney, 1997). Women and men did not differ substantially in use of word processing or email. In fact, the use of email was the only Internet-based application where more women reported frequent use compared to men.

Table 1. Computer and Internet Usage*

Computer application	*Men*	*Women*	**% Difference**
Video games	32.5%	6.9%	**25.6%**
Internet surfing	71.3%	57.8%	**13.5%**
Art or graphics	13.4%	8.4%	**5.0%**
Internet discussion groups	6.1%	2.8%	**3.3%**
Submitting college applications	3.7%	2.3%	**1.4%**
Shopping online	1.7%	0.6%	**1.1%**
Downloading college materials	14.3%	13.9%	**0.4%**
Word processing	93.9%	94.0%	**-0.1%**
Email	69.6%	71.4%	**-1.8%**

* Percent reporting "frequent" use.

These results clearly indicate that among the current generation of college freshmen, men are more "wired" in terms of Internet usage than are women. The reasons for this gender gap in Internet usage is not entirely clear, however it may be that young men are encouraged to use computers and the Internet more than are young women.

More research needs to be conducted to explore the reasons why such a gender gap in access to the online information infrastructure exists.

Electronic Submissions

Even though well over half of the college-bound students in the sample reported downloading college materials from the Internet, it was shown earlier that fewer than one in five students submit college applications electronically. Among the students surveyed, the primary concerns about submitting college applications electronically include:

- Fear that data submitted might be lost in transmission
- Perception that the process was "too impersonal"
- Dislike using credit card on the WWW

Additionally, a large number of respondents also mentioned the user-friendliness of the WWW application as being problematic. For example, students mentioned they were not able to write in the margins on an electronic application like they were able to do on a traditional pen-and paper application. Also, they could not include additional information beyond the scope of the application.

Respondents also expressed concerns about the security of their electronic applications (i.e., "data can be accessed by anyone."), and some thought that admissions officers might perceive them as being "lazy" for applying electronically. They also expressed concern that such applications would not be given the same consideration as paper applications.

Crosstabulations were used to determine significant differences due to gender or race. Overall, women respondents expressed more concern about applying electronically than did men. Compared with men, they were significantly more likely to be concerned that (1) their application data might be lost in transmission, (2) that the WWW application process is "too impersonal", and (3) that their personal computer could not handle the task.

Table 2. Reasons for Not Applying Electronically by Gender

	Men	*Women*	% Difference
Parents/friends perfer paper application	15.1%	11.1%	**4.0%**
Was not aware that submitting electronically was option	11.2%	8.3%	**2.9%**
Thought it might be a disadvantage	12.6%	10.4%	**2.2%**
No computer access	4.5%	4.2%	**0.3%**
Encountered technical problems	5.0%	5.5%	**-0.5%**
Too impersonal	35.8%	37.7%	**-1.9%**
Do not know how application will look	25.7%	28.6%	**-2.9%**
Did not have computer skills necessary	5.5%	9.7%	**-4.2%**
Personal computer cannot handle the task	6.4%	11.1%	**-4.7%**
Do not like using credit card on WWW	29.5%	36.3%	**-6.8%**
Paper seemed more reliable	57.6%	66.9%	**-9.3%**

The reasons given for *not* applying electronically indicate that women are not as comfortable with using the Internet to apply to college as are men. Not only do women report that their computer cannot handle the task of applying electronically than men, they express greater skepticism about the Internet as a whole. This is not surprising given the previous findings which show that men enter college with more experience in all areas of Internet use -- with the exception of email – than do women.

Other slight--although non-significant--differences were found with respect to race. Asian American students had more concerns about the electronic application process than other ethnic groups, including White students. Asian Americans were more concerned than were other ethnic groups about the fact that the electronic application process would not allow them to see how their application would look before they sent it in, and expressed more hesitancy about using a credit card via the WWW. Additionally, almost half were concerned that the data might be lost in transmission (compared with roughly a third of White respondents).

Implications

The most striking finding from this study is that, even among this group of high-achieving students, women still lag behind men in terms of online use and willingness to take advantage of Internet-based applications. Obviously, men are being socialized more to accept computers and explore all aspects of the Internet. They "surf "the Internet more frequently, engage in online discussion groups more often, shop more online, download college materials to a greater degree, and also apply to college online more than women.

This has important implications for both college admissions professionals and institutional researchers who plan to conduct web-based surveys. In terms of the college admissions process, it is probable that men will utilize this option more than will women. Additionally, based on the findings of this study, white students are more likely to use the medium of the Internet for college applications than are non-white students. This might be due to the fact that, even among higher-income households, white families are more apt to have a computer and online access in their home.

The current trend toward mandatory online college applications must take these differences into account. Even though most students (at least in this somewhat privileged sample) have access to the Internet, we have to realize that there are a complex set of online behaviors that differ as a function of gender and/or race. Therefore, the prevailing assumption that online *access* automatically implies online *usage* is not entirely valid. Such differences may even be greater among students who do not aspire to top-ranked institutions.

On the other hand, in terms of the applying to college electronically, many respondents in this sample mentioned user-interface issues as being problematic. This means that they were uncomfortable with the specific WWW college application itself, not necessarily with the *concept* of applying to college via the WWW. It is plausible that as the format for electronic applications become more user-friendly, students will become more amenable to using the Internet to apply to college.

Suggestions for Web-based Survey Research

The findings from this study also provide institutional researchers who plan to administer surveys on the WWW with useful information on how to optimize the effectiveness of online surveys. First, the gender differences found in this study point to the fact that men may well be more likely to respond to an online survey than women. This study showed that men spend more time online than do women, and have a greater range of experience with the different Internet-based applications.

Based on the finding that women use email slightly more than men, using email to contact women about a web-based survey may be an effective way to encourage them to participate in the survey. Additionally, if a link to the survey site can be inserted into the email message itself, and easily accessed by the student, response rates may increase. The key point here is *ease of accessibility* to the survey site from an email platform.

Student concerns about online security and user-friendliness is directly applicable to Internet-based survey research and design. Based on the finding that women and minority students express more skepticism about the Internet, care must be taken to craft a web survey in such as way as to alleviate their fears about confidentiality and reliability. Respondents must be assured to the following *up front* (before the survey instrument is presented):

- The length of the survey, how many questions will be asked, and the time investment required to complete it
- The confidentiality of the responses
- Options to change responses, easily navigate through the survey, and control the final submission of the survey
- Address and phone number of the office administering the survey
- Any prizes or incentives being offered[3]

Additionally, the online survey instruments should include:

- Plenty of room to for complete responses and comments after each item
- Specific contact information displayed *prominently* for respondents to report problems or questions, or to request a paper survey
- Automatic receipt of response after the survey is submitted, including a nice "Thank you!"

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[3] A recent study about how people use the WWW suggested that offering incentives, prizes, or "freebies" resulted in a much better than usual response rate for Web-based surveys (Kiernan, 1998).

- Instructions on where to send additional information or obtain the results of the survey

Because using the Internet for college applications and surveys is a relatively new phenomenon and little research has been conducted that has investigated computer and Internet use among students, this study offers a starting point for both researchers interested in student computer interactions and practitioners who are interested in using the Internet to conduct surveys in college or university settings.

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ON-LINE NEWS VS TRADITIONAL MEDIA: STUDENT PREFERENCE REGARDING THE ACQUISITION OF CURRENT EVENTS

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It is estimated that approximately 90 percent of college and university students in North America have ready Internet access, compared to less than one-tenth of the general population (Chidley, 1996).[1] Given that colleges and universities are now admitting students of the "NET generation", it is imperative that institutions understand how their learners acquire information. There is a dearth in the literature that explores this phenomenon. In fact, it has long been espoused that university students are subject to potentially different patterns of information acquisition than typical adult samples and as a result little is known about how college students acquire information about significant news events (Slater, 1983). A few studies, completed in the early eighties, examined student preferences between television and newspapers (Barrows, Clark & Klein, 1980; Henke, 1998; and Perloff, et al, 1982). To date, there appear to be no published findings that have added electronic news services to the mix.

In the summer of 1997, a contract was signed with Prentice Hall to obtain university-wide access to Simon & Schuster's *College NewsLink*, a web-based newsclipping service with stories classified by academic discipline.[2] As part of the license agreement, it was stipulated that the university would evaluate the product in terms of ease of access, reliability, desirability and usefulness. Simultaneously, there was interest on campus in determining how students prefer to receive their news information. In an era of limited resources, the question was being raised whether the university should use funds to provide multiple subscriptions to the *New York Times* or a daily electronic news service. This paper will describe how the institutional research office went about developing a strategy to evaluate *College NewsLink*, assess students' preferences regarding the acquisition of current events, and the difficulties that were encountered along the way.

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[1] In a recent National Telecommunications and Information Administration report, *Falling Through the NET II: New Data on the Digital Divide*, the 1997 nation-wide data indicated that in American households 18.6% had on-line access, 26.3% had modems, and 36.6% had personal computers (McConnaughy, Lader, Chin & Everette, 1998).

[2] The website address is http://www.ssnewslink.com

METHODOLOGY

The approach taken to evaluate this product was multi-pronged. First, a short survey was administered to all faculty members to ascertain level of familiarity with web-based products. Second, surveys were administered to students in the various classes in which NewsLink was incorporated into the curriculum. Third, faculty members who used NewsLink in their courses were interviewed; and fourth, specific questions were designed and incorporated into the 1998 Graduating Senior Survey.

In October 1997, shortly after NewsLink became available for use on campus, a short survey designed to describe the product and gauge potential interest in incorporating the product into courses was distributed to all Tufts faculty. The survey asked five questions about familiarity and use of NewsLink, willingness to attend a training session, and use of the *New York Times* for teaching purposes. As with many faculty surveys, the response rate was very low at just 6 percent (N=76).

Students in courses where NewsLink was intentionally incorporated into the curriculum (NewsLink-enhanced courses) were queried to ascertain levels of usage and preferences for various web-based electronic information sources. One hundred forty-five students in five classes were surveyed. The courses were exclusively in the social sciences: Introduction to Psychology, Cognitive Aspects of Intergroup Relations, Survey of Social Theory, Judicial Politics, and Political Psychology. The survey instrument focused on student usage of electronic news services, students' perceptions of the quality of two distinct web-based products, the magnitude of student usage of additional electronic tools, the types of resources utilized for research papers and projects, student newspaper reading behavior, and student preferences for obtaining current events.

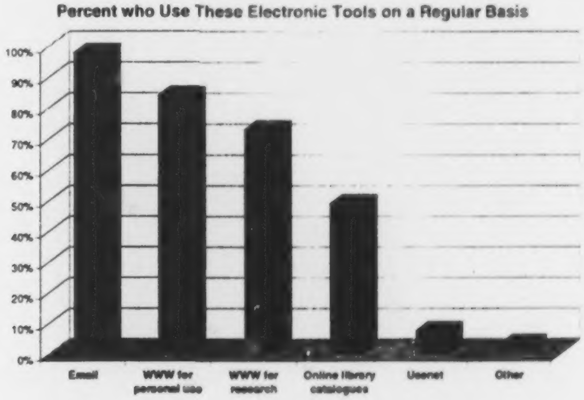
At the close of the spring 1998 semester, the five faculty members who incorporated web-based products into their courses were interviewed. The interview protocol was quite extensive. Faculty were asked to provide information regarding their satisfaction with the specific web-based tools, a description of how the tool was integrated into their curriculum, their perceptions of student use, and an assessment of how such tools could be made available to other faculty members in their department.

The 1998 Graduating Senior Survey included a limited number of questions regarding the acquisition of current events. Specifically, students were asked four questions: 1) whether they had used the on-line electronic news services, 2) to identify the newspapers they read on a regular basis, 3) to identify the information sources that they used during the academic year to learn about current events, and 4) their preferred source of current events information. Members of the Class of 1998 were surveyed prior to May graduation. The overall response rate was quite high (approximately 97%).

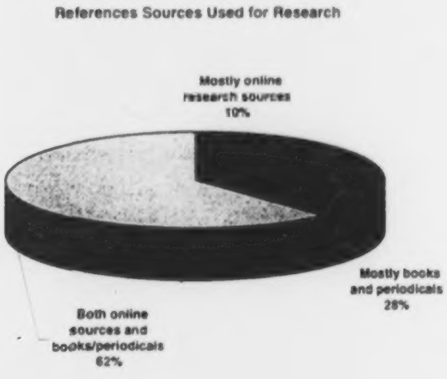
FINDINGS

Use of Electronic Resources

Tufts undergraduates are definitely part of the NET generation. Almost 100 percent of the students in the NewsLink-enhanced courses reported using email regularly, 84 percent use the World Wide Web (WWW) for personal use, 73 percent use WWW for research, 49 percent use on-line library catalogues, and approximately 8 percent use listservs & newsgroups (Usenet).



Of those students who use on-line resources for research papers and projects, most (68%) use these resources in tandem with books and periodicals. In addition,



approximately 13 percent of the students in surveyed classes use the internet for research purposes as their main reference source. It is interesting to note that 43 percent of the respondents indicated that they had received training or asked for assistance in using Tufts electronic research tools.

Examination of this population, albeit small, suggests that there are some significant differences between men and women in their approach to the use of electronic resources. More undergraduate men (92%) than women (78%) reported using the WWW for personal use. Undergraduate women reported using multiple-sources (both on-line resources and traditional resources, such as books and periodicals) for research purposes more frequently than their male counterparts (71% vs. 50%). Women were also more likely to indicate that they had received training for Tufts electronic research tools (48% vs. 37%).

There appear to be very few differences between the various classes and their use of electronic resources. Our initial hypothesis was that we would see more activity among the lower classmen than the upper classmen. Regardless of class year, all students seem to be using email with about the same frequency. A slightly higher proportion of first-year and sophomores reported using the WWW for personal use and research. However the differences were not significant. Juniors and seniors reported using the on-line library catalogues with greater frequency than first-years and sophomores. Thus, it is not surprising that significantly more upper classmen reported having received training on Tufts electronic research tools.

NewsLink vs. Lexis-Nexis

Specific examination of students' perceptions of the quality of two distinct web-based products revealed that students were generally satisfied with these on-line electronic news services and would recommend them to other students. Over three-quarters of the respondents indicated that they would recommend these products to other students (NewsLink 75.6% vs. Lexis-Nexis 79.1%).

Usage of both NewsLink and Lexis-Nexis among students in the classes where faculty had purposefully introduced on-line electronic new services was surprisingly low. Approximately 41 percent of the students in these five classes indicated that they had used NewsLink or Lexis-Nexis. This compares with 34.7 percent of graduating seniors who indicated they had utilized these products. Approximately 21 percent of the 1998 seniors indicated that they were "not familiar" with these products, which suggests that "lack of awareness" is not the primary cause for limited use among students.

Frequency of use varied between the two products. Students reported using Lexis-Nexis more often. Approximately 46 percent of the students used Lexis-Nexis more that once during the semester as compared to only 37.4 percent reporting the use of NewsLink more than once a semester.

Access to the on-line services was reliable and there appeared to be very little difference between the two products. The majority of respondents found access to the NewsLink site to be sufficiently fast at all times of the day, with the overwhelming majority finding it sufficiently fast in the morning (96.8%) and at night (84.6%). This was equally true of Lexis-Nexis. The majority of students (67.2%) tended to access

NewsLink from their residence halls. In contrast, more students reported (36.7% vs. 23%) accessing Lexis-Nexis from Tisch Library.

It appears from the student perspective that both products provide ready access to recent and relevant news articles. Most (78.6%) of the students who used NewsLink to find articles for a class assignment or project were able to find a sufficient number of articles to support their research. This was also true for students (76.9%) who used Lexis-Nexis.

Students found both products fairly easy to use. In fact, the vast majority (88.1%) found it "very" or "moderately easy" to find pertinent articles on NewsLink. This was also true for the Lexis-Nexis product. While most found it easy to find articles in their subject area, it is important to look at the difficulties students reported. For both NewsLink and Lexis-Nexis, several students stated difficulties in narrowing their search and were frustrated with having to sift through hundreds of irrelevant articles. A few respondents encountered technical problems, including having the programs crash on their home computers and not being able to print from campus computer labs.

At the close of the spring 1998 semester, five faculty members were interviewed. The interview protocol was quite extensive. Faculty were asked to provide information regarding their satisfaction with the specific web-based tools, a description of how the tool was integrated into their curriculum, their perceptions of student use, and an assessment of how such tools could be made available to other faculty members in their department.

Since not all faculty were familiar with both products, it is difficult to provide a comprehensive comparative evaluation. Of the three faculty members who had used both products, it was clear that they preferred Lexis-Nexis. The primary concern with the NewsLink product was the organization and categorization of subject matter. News articles are grouped in ways that do not correspond with the current organizational structure of academic courses. In order to be a useful tool, faculty suggested that the categories need to be modified so that they more closely match standard divisions within each academic discipline. Faculty members in several disciplines (economics, sociology, and psychology) articulated this concern. In addition, there is no feature available that allows the users to set up a "personal keyword search" and receive only relevant articles on a regular basis.

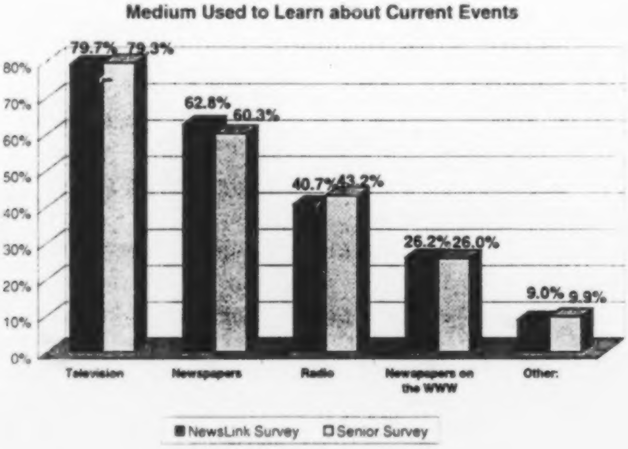
Faculty seemed more likely to use these on-line electronic news services for research purposes and to enhance the currency of their curriculum than as a teaching aid. In most cases, students were encouraged to examine these resources and use them to provide background information and direction for additional exploration.

The five faculty members concurred that students were generally receptive to using these on-line electronic resources. However, they were quick to point out that students need at least rudimentary training in keyword search techniques for web-based research tools.

METHODS OF NEWS ACQUISITION

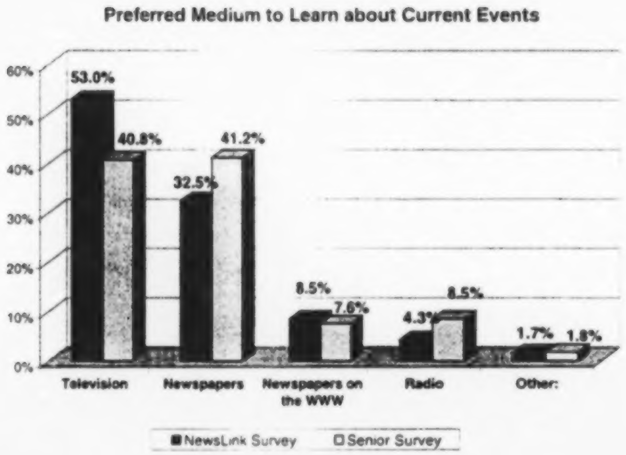
Members of the Class of 1998 and students enrolled in the *NewsLink*-enhanced courses were asked a variety of questions to determine their preference for acquiring current events information, which medium they actually use for this purpose, as well as which newspapers they read on a regular basis.

Our analysis revealed that most respondents read a newspaper on a regular basis. Responses varied between the two surveyed groups, approximately 77 percent of graduating seniors reported that they do read newspapers, compared with 92 percent of the students in NewsLink-enhanced courses. Both groups most frequently read the *Boston Globe*, *the New York Times*, and the *Tufts Daily*.

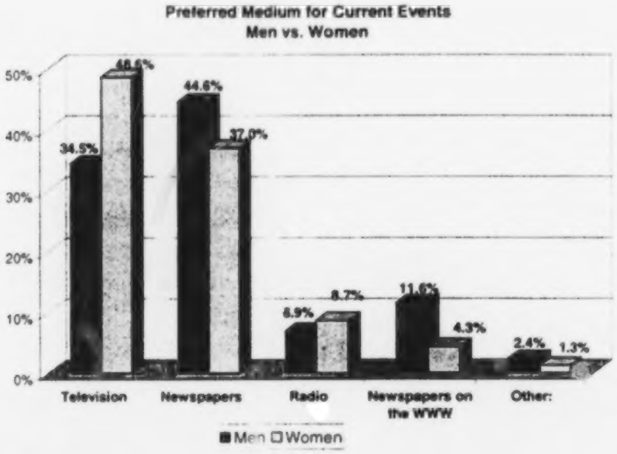


More students rely on television as their source of news. When given a choice, most students in NewsLink-enhanced classes prefer television to keep up with current events. Among the students who were enrolled in the NewsLink-enhanced classes, 79.3 percent indicated that they relied on television as a news source, while 63 percent indicated that they used the newspaper. Similarly, 79.7 percent of seniors indicated that they relied on television as a news source, while 60.3 percent indicated that they used the newspaper. When asked which they preferred, 53 percent of students in NewsLink-enhanced classes identified "watching news on television" as the preferred source.

Graduating seniors were more split on their preferred medium for current events, with slightly more preferring hardcopies of newspapers (41.2%) than television (40.8%).



Examination of preferences by gender revealed significant differences. In both populations, a higher percentage of women than men relied on television as a source of current events. Conversely a higher proportion of men than women read hard copies of newspapers. In fact, almost 50 percent of the women indicated that their preferred source



of current events information was television as compared to only 34 percent of the men with a similar preference. A higher proportion of men (44%) identified hard copy newspaper as their preferred source.

PROBLEMS ENCOUNTERED

In the course of this evaluation, we encountered several difficulties that seemed to stem from a lack of central control over academic and research technologies on campus. This problem is probably not unique to Tufts, and has potential implications for other institutional researchers undertaking evaluations of internet-based research and teaching tools. At Tufts, there were no university-wide procedures for the review, purchase, marketing and technical support of new electronic research and teaching tools. Depending on perceived potential users and uses, electronic resources may be purchased, and therefore marketed and supported, by different departments or schools.

The NewsLink product in particular was problematic because of its multiple applications: for news acquisition, for research, or as a teaching aid. This created confusion over which department should be responsible for supporting and promoting the product. Amidst all this confusion, as institutional researchers, it was our responsibility to fulfill a contractual obligation to evaluate this product. However, because marketing for NewsLink was virtually non-existent, it was difficult to find a sufficiently large sample of current users who would be able to evaluate the product in terms of ease of use, access, reliability and desirability.

The current structure of our Internet servers also created problems in collecting data that could be helpful in measuring frequency of use. Prentice Hall provided us with monthly data on the number of requests and bytes sent on various Tufts subdomains. These subdomains represent the different web servers on campus, some serving a single academic department or computer lab, others serving the bulk of administrative, student and faculty units. On the frequency reports, the names and number of subdomains reporting activity differed each month, preventing cross comparisons. In addition, the bulk of activity occurred on the two servers that serve all three constituencies, making it impossible to discern whether students, faculty or staff accessed NewsLink most frequently.

SUMMARY

Overall, students who used NewsLink and Lexis-Nexis were generally satisfied with these on-line electronic news services and would recommend them to other students. Respondents were generally very satisfied with ease of access and the ability to find pertinent articles. However, less than 50 percent of respondents indicated that they had used the products in the past year. Thus, it appears that while students are frequently at a computer and on the Internet for email or research, they generally do not choose to use the Internet to get their current events information. Rather, Tufts students rely on television and newspapers as their sources of news information. Moreover, students prefer television to newspapers.

Given the rapid increase in the utilization of the WWW, it is quite likely that this is the wave of the future. In fact, students may always prefer television as a source of news; however, with proper training and promotion, there is the possibility of increased utilization of such web-based research tools. For these tools to be embraced, both students and faculty will need to use the products and determine whether they will enhance their research.

It is clear that student and faculty use of electronic resources is not a passing phenomenon. The demand for resources to support these new technologies and sources of information, in all likelihood, will dramatically increase in the future. Thus, it is critical that institutions begin to examine both usage and effectiveness. The next step at Tufts will be to develop a research plan and protocol that will address how to systematically evaluate utilization of resources, student and faculty preferences, effective integration of technology in the classroom, and demand for training.

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USING PREDICTIVE MODELING TO TARGET STUDENT RECRUITMENT: THEORY AND PRACTICE

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In the competitive market of student recruitment, college admissions offices are experimenting with the use of predictive models to increase the effectiveness of their recruitment efforts. Regression analysis is used to estimate students' probability of enrollment. Then different recruitment activities are directed at students with different enrollment probabilities. This paper argues that a typical use of predictive modeling is theoretically unsound and may therefore be operationally inefficient. To test this hypothesis and explore an alternative use of predictive modeling we designed and assessed an experimental recruitment program. The first-year results confirm our perspective and identify a valuable role for statistical modeling in recruitment management.

THEORETICAL CONSIDERATIONS

Predictive modeling is frequently used to identify the students most likely to apply or to enroll in a college or university so that admissions staff can concentrate their attention on these "hot prospects" in order to enroll more students. While this is an attractive approach it may not be an efficient one.

Consider, for example, the hypothetical responses shown in Table 1 to a recruitment initiative such as a special mailing or invitation to a campus open house. After the intervention almost all the students in Group A enroll. It increases their average enrollment probability from 80% to 85% and adds 5 students to the entering class. In Group B, the students have only a 30% chance of enrolling after the recruitment intervention, but it increases their probability by 10% and enrollment by 10 students. The students in Group A are "hot prospects" in that they are likely to enroll, but devoting admissions office efforts to their recruitment diverts resources away from the target population on which they would have the greatest impact.

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[1] This project was a collaborative effort between Institutional Research, Admissions and the Department of Economics. Essential contributions were made by Gigi Lamens and Manuel London who made the experimental use of predictive modeling an integral part of their recruitment plan, Paula Pelletier and Dave Taiclet who assisted with data management, and Mark Montgomery who provided statistical advice.

Table 1. Hypothetical Recruitment Intervention

	Group A	Group B
Number of students	100	100
Probability of enrollment w/o intervention	80%	20%
Probability of enrollment with intervention	85%	30%
Yield without intervention	80	20
Yield with intervention	85	30
Effect of intervention	5	10

To be efficient, recruitment programs should be directed at prospective students wavering on the brink of an enrollment decision and most susceptible to the additional encouragement provided by recruitment efforts. Admissions resources should be targeted where they will cause the greatest increase in the probability of students' enrolling, and those may or may not be the students with the highest probability of enrollment. In the language of economics, admissions office resources will be used efficiently if they are used where they have the greatest marginal impact. It is these "fence sitters" rather than the "hot prospects" that predictive modeling should help identify.

Focusing on high-probability students may also be ineffective by directing attention away from the most institutionally desirable prospective students. It is likely that high-achieving students have more attractive alternative admissions offers to consider and therefore lower enrollment probabilities. Conversely, the "hot prospect" high-probability students are likely to have weaker academic credentials.

Though theoretically sound, targeting recruitment programs to students susceptible to persuasion is problematic in practice. Neither admissions personnel nor researchers know the efficacy of different interventions or how prospective students' response to recruitment efforts varies with their absolute enrollment likelihood. Predictive modeling can, however, be used to develop efficiently targeted recruitment programs. By providing estimates of students' pre-intervention enrollment probabilities, it can support experiments to test the marginal impact of various recruitment initiatives. The rest of this paper describes a test of the value of this approach. This project began with the development of a predictive model, used the model to select samples of students on which to test an experimental recruitment initiative, and conducted the experiment to determine its differential effect on students with different enrollment probabilities.

PREDICTION IN PRACTICE

Developing a predictive model of students' enrollment decisions requires selecting a study population, identifying variables likely to affect students' enrollment probabilities, developing a prediction procedure, and using the model to test the effects of experimental recruitment activities. This section describes how we completed each of these steps to develop a better understanding of our university's applicant pool and support targeted recruitment efforts.

Population. The model we developed predicts the probability that a student offered admission to our university as a full-time freshman in the fall will enroll. The focus on admitted students distinguishes this project from another common application of predictive modeling. Models can also be used to assess the likelihood that students who inquire about admission will actually complete an application. We chose instead to focus on admitted students because increasing the enrollment yield from this pool is a priority for our Admissions Office. Moreover, far more information is available about admitted students, increasing the likelihood of accurate predictions.

Predictive Variables. The selection of variables for a predictive model of students' enrollment decision depends on a combination of theoretical considerations—regarding the student characteristics likely to affect enrollment in a specific college—and practical considerations—regarding the availability of data. Our model includes four kinds of variables: demographic, academic, geographic, and behavioral (Table 2). Some are likely to be important with any student population while others may be relatively specific to our campus. Statistically insignificant variables are included because our goal is accurate prediction, and retaining all the variables increases the model's overall accuracy.

Most of the predictive variables are significant at at least the 10% level. The highly significant variables (1% level) positively related to enrollment are high-yield high school average, high-yield SAT score, high-yield math SAT, high-yield verbal SAT, high-yield zip code, and open house attendance. Dummy variables indicating whether a student's high school average and SAT scores are within ranges that historically yield a high number of enrollees are used instead of the raw values of these variables because there is no reason to believe they are linearly related to the probability of enrollment. Categorical variables with large numbers of values—like the student's high school and zip code—can only be included in the regression through a classification scheme reflecting the historical relationship between students' geographic origins and enrollment.

Variables significant at the 1% level and negatively related to enrollment include White or Hispanic ethnicity, US citizenship, regular admission status, early application and on-campus housing request. The model's insignificant variables are age, gender, Asian ethnicity, having an intended major, having an intended science major, speaking English as a native language, low family income, and residing in a high-yield zip code.

Additional variables could improve the model. For example, the behavioral variables—relatively early application and open house attendance—offer very limited information about how eager students are to attend our university, and we hope to add other indicators in the future.

Table 2. Variables in the Logistic Regression Model

Variable	Coefficient	Description
DEMOGRAPHIC VARIABLES		
Age	-0.2285	college age: 17-19 years old
Gender	0.0448	male = 1, female = 0
White	**-0.3770*** **	**ethnicity is White**
Asian	-0.0777	ethnicity is Asian-American
Hispanic	**-0.4139*** **	**ethnicity is Hispanic-American**
Black	**-0.2705* **	**ethnicity is African-American**
Citizen	**-0.7161*** **	**United States citizen**
Permanent resident	**-0.4206* **	**US permanent resident**
English	-0.1056	English is native language
High income	**-0.1794** **	**high self-reported family income (≥$75,000)**
Low income	0.0919	low self-reported family (<$39,000)
Status	**-0.4339*** **	**1=regular admission, 0=special**
ACADEMIC VARIABLES		
HY HS average	**0.2389*** **	**high-yield high school average**
HS missing+	**1.0382*** **	**missing high school average**
HY SAT	**0.3857*** **	**high-yield SAT combined score**
SAT missing+	**-0.9218*** **	**missing SAT score**
HY math	**0.3048*** **	**high-yield SAT Math score**
HY verbal	**0.2433*** **	**high-yield SAT Verbal score**
Major	-0.0718	application indicated an area of interest
Science major	0.1224	application indicated science interest
GEOGRAPHIC VARIABLES		
HY HS	**0.3929*** **	**high-yield high school**
HY Zip	0.0902	high-yield zip code
NYC/LI	**0.4418*** **	**lives in NYC or Long Island**
BEHAVIORAL VARIABLES		
Applied early	**-0.3872*** **	**applied before December 1**
Open house	**0.9706*** **	**attended an open house**
Campus housing	**-0.7676*** **	**requested on-campus housing**
CONSTANT	0.0594	

* significantly different from zero at the 10% significance level.

** significantly different from zero at the 5% significance level.

*** significantly different from zero at the 1% significance level.

+ These variables permit cases with missing data to be included in the model. Actual scores are used where available, and an alternative coefficient is assigned to missing data.

The model's accuracy would almost certainly be improved by financial aid data such as the percentage of a student's financial aid need met, the types of aid offered, and the date on which the financial aid offer was mailed. However, including these variables would limit the model's usefulness because financial aid information does not become available until relatively late in the recruitment process. A model including financial aid measures could not be used to identify students' enrollment probabilities early enough to allow time for targeted recruitment efforts, and we chose not to include them.

Prediction procedures. We used logistic regression to predict students' enrollment probabilities. The theory is simple. Consider, for example, a simplified case in which the only thing known about students is whether or not they are female. If in one year 100 female students are admitted and 60 enroll, the probability of a female student's enrolling is 60%. Hence we can predict that the enrollment probability of a female student admitted in subsequent years will also be 60%. Logistic regression merely permits a large number of student characteristics to be incorporated in this type of calculation.

Three years of data are required to develop the predictive model, test its stability, and use it to analyze recruitment initiatives. We used 1996 data to develop the model by estimating the values corresponding to 60% in the simplified example. Based on those values we predicted the enrollment decisions of students matriculating in fall 1997 and compared students' predicted and actual behavior to evaluate the model's accuracy. We then used the model to predict the enrollment behavior of students entering in fall 1998, with and without an experimental recruitment initiative.

Prediction results. For logistic regression there is no simple statistic measuring the accuracy of a model comparable to the R-square statistic computed for linear regressions. Instead the model's predictive power can be assessed by measuring goodness-of-fit through classification tables that compare results predicted by the model with students' actual enrollment decisions.

In order to draw this comparison it is necessary to decide what counts as a "prediction of enroll" since the regression predicts enrollment probabilities as a continuous variable. A cut-off probability level must be selected, above which a student is counted as being predicted to enroll and below which a student is counted as predicted not to enroll. The selection of this cut-off value is somewhat arbitrary. We used 0.30 because about 30% of our admitted students enroll and because we prefer the way predictions using this cut-off compare with students' actual enrollment decisions. Lower cut-off points result in lower overall accuracy while higher cut-off points substantially underestimate the number of students who enroll.

Table 3 shows the results of using the model estimated using fall 1996 data to predict fall 1997 enrollment decisions.

Table 3. Predicted and Actual Enrollment

	PREDICTION		
ACTUAL BEHAVIOR	Predicted to enroll	Predicted not to enroll	TOTAL
Enrolled	**1,219**	917	2,136
	16%	12%	27%
Did not enroll	1,450	**4,223**	5,673
	19%	**54%**	73%
TOTAL	2,669	5,140	7,809
	34%	66%	100%

The upper left and lower right quadrants represent correct predictions by the model: 1,219 students (16% of the total) were predicted to enroll and actually enrolled, while 4,223 students (54% of the total) were predicted not to enroll and did not enroll. The model is accurate 70% of the time, which is a significant improvement over the prediction possible without the regression model. An uninformed projection would predict enrollment correctly 27% of the time, since 27% of all admitted students actually enrolled.

Table 4 offers further assurance that the model accurately assigns probabilities to admitted students by confirming that the actual enrollment decisions of students in different predicted probability ranges corresponds to the prediction. For example, the first row shows that 9% of the students with predicted enrollment probabilities between 0% and 10% actually enrolled.

Table 4. Predicted and Actual Enrollment by Probability Range

predicted enrollment probability	percent enrolled	number of students
0%-10%	9%	1,495
10%-20%	17%	2,219
20%-30%	28%	1,426
30%-40%	39%	1,051
40%-50%	46%	768
50%-60%	51%	450
60%-70%	58%	270
70%-80%	57%	103
80%-90%	57%	23
90%-100%	0%	1
TOTAL		7,806

In ranges up to 60%, the percentage of students who actually enrolled falls within the predicted probability range. Above that there is a discrepancy between the predicted probability and the actual percentage who enrolled, but there are not many students in those ranges and more than 50% of the students in each range actually enrolled, double the overall enrollment percentage. The estimated model fits the data quite well.

These results confirm the importance to our university of recruitment initiatives targeting students with low predicted enrollment probabilities. Most of both the admitted students and the students who actually enroll have low enrollment probabilities.

Other institutions' admissions pools may display different patterns. Our large number of admitted students with low enrollment probabilities may, for instance, be attributable to a systemwide application system that makes it easy for students to apply to several campuses. The distribution is institutionally important, however, because knowing its shape has helped the Admissions Office better understand its target population.

The analysis of admitted students by enrollment probability also confirms the hypothesis that targeting recruitment efforts to the students most likely to enroll does not focus attention on those with the strongest academic credentials. Enrollment probability is inversely related to average SAT score (Table 5).

Table 5. Average SAT Score
by Probability Range

predicted enrollment probability	Average SAT score	number of students
0%-10%	1250	1,495
10%-20%	1217	2,219
20%-30%	1169	1,426
30%-40%	1120	1,051
40%-50%	1058	768
50%-60%	1034	450
60%-70%	1012	270
70%-80%	1020	103
80%-90%	976	23
90%-100%	-	1
TOTAL		7,806

In this population of admitted students, targeting hot prospects does not direct recruitment efforts to high-achieving students. Effective recruitment requires attention to low-probability students. To investigate whether recruitment initiatives aimed at students with low enrollment probabilities would also be efficient, we designed a recruitment experiment.

A RECRUITMENT EXPERIMENT

Experimental design. With enrollment growth an institutional goal, our Admissions Office was interested in identifying recruitment efforts that would increase freshman enrollment by increasing the relatively low percentage of admitted students who enroll. Specifically, Admissions wished to test the efficacy of increased contact with admitted students and their parents through activities requiring modest staff effort so that, if successful, those activities could be expanded to a large group of students.

To carry out this test, we designed an experiment to compare the enrollment decisions of students to whom the new program was directed—the experimental group—and students not affected by it—the control group. The experiment focused on students with enrollment probabilities between 30% and 60%—the middle of the distribution—because the experimental recruitment initiative was designed for use with a large number of prospective students.

The experimental and control groups are shown in Table 6. The experimental group initially included 200 students, the largest number to which the Admissions staff felt they could devote additional attention, divided into equal-size experimental groups to facilitate comparisons among the three probability ranges. This experimental group was subsequently expanded to include half the students in the highest predicted probability ranges. The control groups were all students with comparable enrollment probabilities who had been admitted at the time the samples were drawn.

Table 6. Experimental Groups

Probability range	Experimental group	Control group
30-40%	67	447
40-50%	67	178
50-60%	67	64
> 60%	125	130

Students in the experimental group received an additional invitation to visit the campus, and their parents received two special mailings. Most of these students also received expedited financial aid packaging, and as many as could be reached were contacted in a financial aid telethon. The experiment was not perfectly controlled in that it included several different interventions, some of which did not include every student in the experimental group. It was, however, sufficient to provide initial evidence of the program's efficacy.

Experimental results. The experimental program increased enrollment in the groups with relatively low enrollment probabilities. Of the students with enrollment probabilities between 30% and 50%, 42% of the experimental group enrolled compared to only 33% in the control group (Table 7), and this difference is statistically significant.

Table 7. Effects of the Recruitment Experiment

Probability of enrollment		Enrolled	Not enrolled	Number
30-50%	Experiment	42%	58%	134
$p = .04$	Control	33%	67%	625
50-60%	Experiment	33%	67%	67
$p=.05$	Control	50%	50%	64
60-90%	Experiment	49%	51%	125
$p=.24$	Control	56%	44%	130

In the groups with higher enrollment probabilities, the experimental program did not increase enrollment. Additional attention appears to have had no effect on students with the highest enrollment probabilities—the 60% to 90% group. In this probability range fewer students in the experimental group enrolled, but the difference between the experimental and control group is not statistically significant. In 50-60% range fewer students in the experimental group enrolled, and the difference is statistically significant, an unexpected result that may be a product of small sample size.

While the accuracy and reliability of these results is limited by the small sample and imperfectly controlled experiment, they strongly suggest that students with relatively low enrollment probabilities are more susceptible to increased recruitment efforts. We plan to replicate and refine the experiment in future years with the hope of confirming this conclusion and determining the contribution of the different elements included in the experimental recruitment program.

CONCLUSION

The recruitment experiment indicates that to support enrollment growth our Admissions Office should include students with relatively low enrollment probabilities among its recruitment targets. A modest increase in the attention these students receive appears to have a significant effect on their behavior. Extending the experimental recruitment program to all students with enrollment probabilities between 30% and 50% would have increased the freshman class by about 70 students or 3%.

These results confirm the importance of the insight on which this project was based. It appears that recruitment efforts should not focus on "hot prospects," though further research with larger samples, more strictly controlled experiments, and different admissions pools is needed to verify this conclusion. Concentrating recruitment efforts on the "hot prospect" students appears to be inefficient—by diverting resources away from the population on which they have most effect—and ineffective—by focusing on students who are not the strongest candidates in the admissions pool.

The experiment also demonstrates a more general point: recruitment initiatives are relatively easy to assess. Compared to other assessment targets the outcome to be measured is simple: students either do or do not enroll. By providing a baseline prediction of students' behavior, predictive modeling can be a valuable research tool in an admissions office willing to experiment and assess the results of different recruitment activities.

Technical feasibility is not, however, the only issue in implementing assessment-based recruitment management. This approach makes significant demands on admissions staff who must have good data in a usable form and be willing to take some unusual risks. An experimental approach requires devoting resources to the recruitment of students who are unlikely to enroll. While a controlled experiment is in progress it also requires excluding some students from recruitment efforts that could increase enrollment. These are difficult actions for admissions staff under pressure to meet enrollment targets. In this context the research orientation of institutional research staff can provide encouragement while their technical expertise supports innovation. A project such as this requires active collaboration between institutional research and admissions to insure that predictive modeling is more than an academic exercise, but it can be a very fruitful collaboration.

COMPARING ADMINISTRATIVE SATISFACTION IN PUBLIC AND PRIVATE HIGHER EDUCATION

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ABSTRACT[1]

Do administrators in public higher education experience different levels of job satisfaction than their counterparts in the private sector ? Drawing upon the management, higher education, and public administration literature, this study examines a comprehensive array of national data on university characteristics, state characteristics and administrative satisfaction. Such research is important because of the connection in the literature between levels of satisfaction and employee productivity and managerial turnover. The findings suggest that the hypothesized public/private differences are limited to the sub-components of satisfaction reflecting extrinsic rewards and relationships with others. In both sectors, job satisfaction is most consistently linked to work environments characterized by teamwork and low levels of interpersonal conflict.

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[1] Tables referenced in this article can be obtained by contacting the authors.

Comparing Administrative Satisfaction in Public and Private Higher Education

The Research and Policy Problem

Much has been written about managerial satisfaction in business and public administration, but most studies in higher education have examined the satisfaction levels of faculty rather than administrators (Austin & Gamson 1983, Gmelch, Lovrich, and Wilke 1984, Cotton and Tuttle 1986, Smart 1990, Olsen 1993, Hagedorn 1994). The few studies of administrative satisfaction in higher education focus primarily on understanding the nature and level of satisfaction, rather than on examining the factors producing satisfaction and the subsequent connections to important outcomes such as turnover and productivity found in the management literature (Solomon & Tierney 1977, Smart and Morstain, 1975, Blix and Lee 1991, Glick 1992).

One important claim in higher education is the connection between autonomy and quality. Previous attempts to empirically measure the relationship between quality and autonomy at the institution level have proved inconclusive (Volkwein 1986, 1987, 1989; Volkwein & Malik 1996, 1997). However, the literature on job satisfaction leads one to expect that autonomy may indirectly effect institutional quality through gains in productivity that result from job satisfaction (Vroom 1964, Porter and Lawler 1968). A previous study of public universities reveals little direct relationship between campus autonomy and administrative satisfaction in public universities (Volkwein, Malik and Napierski-Prancl, 1998). While their study did not examine private universities as perhaps the most extreme examples of autonomy, it found a consistent connection between every measure of administrative satisfaction and the human relations aspect of university administration.

These findings from the higher education literature are consistent with evidence from public administration research that found public professionals deriving their job satisfaction primarily from the social aspects of their jobs and only secondarily, from the work itself (Emmert and Taher, 1992). Additional public administration literature also suggests that job satisfaction varies in significant ways between the pubic and private sector (DeSantis and Durst, 1996; Steel and Warner, 1990). In this regard, it is both reasonable and important to explore the nature and levels of administrative satisfaction in public and private universities in order to understand any important differences that may exist.

Purpose of the Study and Conceptual Frameworks

Do administrators in public and private higher education experience different levels of satisfaction ? Are the influences on administrative job satisfaction similar or different in public versus private universities? This research examines the perceived work environments and individual characteristics of administrative managers in both public and private higher education. In addition to survey data on perceived work environments, we have also incorporated university and state characteristics consistent with a variety of theoretical perspectives from the research literature: organizational theory, structural/functional perspectives, the literature on university autonomy, and theories of employee satisfaction.

Job Satisfaction

At the core of this study is the job satisfaction literature. There is general agreement in the literature that job satisfaction is multi-dimensional. Herzberg's Two Factor Theory (1966) draws our attention on the one hand to intrinsic job content factors (such as feelings of accomplishment, recognition, and autonomy), and on the other hand to extrinsic job context factors (such as pay, security, and physical working conditions). Several studies have examined the intrinsic and extrinsic dimensions of job satisfaction in higher education (Olsen, 1993; Austin and Gamson 1993; Hackman and Lawler, 1971, Kalleberg 1977, Hagedorn 1994).

In addition to agreement in the literature that job satisfaction is multi-dimensional, most studies conclude that satisfaction is influenced by a complex array of personal and situational circumstances (Austin & Gamson, 1983; Hoppock, 1977; Mumford, 1972; Bruce and Blackburn, 1992). Research has shown that several work related variables exert positive and significant influences on administrative satisfaction -- a supportive organizational culture, teamwork, relationships with colleagues and superiors, worker autonomy, and self-fulfillment (Berwick 1992, Bensimon & Newman 1991, Austin & Gamson 1983, Boone 1987, Lawler 1986, Rigg 1992, Volkwein, Malik and Napierski-Prancl, 1998). Most management experts to argue in favor of worker autonomy and organizational flexibility (< biblio >) use Maslow's hierarchy of needs. Job and workload stress exert negative influences on satisfaction and are almost always included in studies of job satisfaction (Blau 1981, Blix & Lee 1991, Glick 1992, Olsen 1993, Hagedorn 1996, Volkwein, Malik and Napierski-Prancl, 1998)

Organization and Environment Perspectives

Perspectives from organization theory emphasize the importance of the organization's structure and its environment (Hall, 1995; Lawrence and Lorsch, 1967; Aldrich, 1979; Pfeffer and Salancik, 1978). Scholars often divide an organization's environment into economic, political, social, and technological dimensions. Additional research, specifically from studies of colleges and universities, have demonstrated that campus mission, size, wealth, complexity, and selectivity exert significant influences (ranging from small to large) on a variety of college outcomes (Pascarella and Terenzini, 1991; Austin & Gamson 1983; Hall 1995). The organizational and environmental literature generally leads us to expect that an array of campus and state characteristics may exert significant influences on administrative satisfaction.

Individual Characteristics

Consistent with research in other organizations, studies of managers in colleges and universities suggest that a variety of personal and organizational variables exert potential influences on their job satisfaction. Among these personal characteristics are physical and mental health, age (Austin, 1985; Lee & Wilbur, 1985; Solomon & Tierney, 1977), sex (Austin 1985; Hagedorn 1996), level of education (Martin and Shehan 1989), length of service (Bamundo & Kopelman 1980), administrative rank (Austin & Gamson 1983), and administrative area (Glick, 1992).

Research Methods

Guided by these various perspectives and concentrating on variables potentially important to job satisfaction, we created the analytical database for this study drawing information from a wide range of different sources. This study employs the same methodology as an earlier investigation that examined administrative satisfaction and the regulatory climate at public universities (Volkwein, Malik, & Napierski-Prancl, 1998). The previous investigation collected survey responses simultaneously from both public and private university administrators at cooperating campuses. We added data reflecting campus organizational and environmental characteristics and then engaged in data reduction techniques using principle components analysis and scale building techniques. The resulting variables and scales form the basis for examining the nature of administrative satisfaction in public and private universities.

Target Population, Data Sources, & Variable Summary

Table 1 summarizes the nature of the variables used in this study. Campus characteristics reflecting organizational mission, size, wealth, quality, and complexity are based upon the factor analytic and scale building procedures described in Volkwein and Malik, 1997. Sources for the data include NCES/IPEDS, the National Research Council study of doctoral programs(1995), the Graham and Diamond national study (1996), and the guidebook information contained in Barron's and US News.

Our scale of autonomy and flexibility measures the nature of the external environment at each institution. For public institutions, we use the three-category (high/medium/low) scales developed by Volkwein and Malik (1997). For the separate administrative and academic autonomy dimensions, each campus is classified as high (one standard deviation above the mean), low (one standard deviation below the mean), or medium. This forms the first three categories of a four-category continuum. All private universities are classified as falling in the fourth (or highest) autonomy category.

The respondent characteristics (age, ethnicity, sex, rank, etc.), as well as their reported working conditions, personal stress, and satisfaction levels, are extracted from our survey that was administered by cooperating campus officials to a population of managers at public and private universities. This survey was administered to 12 managers (ranging from vice presidents to directors) on each campus. This survey contains 7 questions about the respondent's background, and 44 items assessing their satisfaction, stress, and working conditions. Using follow-up procedures that guaranteed respondent anonymity, we eventually received an 80% response rate -- about 1200 satisfaction surveys from 120 cooperating public and private universities.

The survey assesses the respondents' work climate and sources of stress on a series of survey items with 5-point response scales. The resulting measures are consistent with those produced by Volkwein et al.(1998), and are summarized in Table 1. Finally, the survey contains 25 satisfaction questions where responses are solicited on a 5-point Likert-type scale from very satisfied (5) to very dissatisfied (1). Congruent with the procedures employed by Volkwein, et al.(1998), our principal components and data reduction techniques produced four scales in addition to the single "overall satisfaction" measure: intrinsic satisfaction, extrinsic satisfaction, satisfaction with working conditions, and satisfaction with colleagues and other people one works with. The alpha reliabilities on these four multi-item scales are shown in Table 1 for the two populations. They range from .74 to .90. These four scales plus the single "overall" item are the dependent measures in this study. While the original scales were constructed using a public university population, the alpha reliabilities of the work climate, stress, and satisfaction scales from private university administrators are in most cases even stronger than those in public universities. More information about the psychometric characteristics of these measures can be obtained from the first author.

Tables 2a and 2b show the number of respondent's by functional area and rank, as well as the number of respondent's from public versus private universities. As described in Volkwein et al.(1998), we targeted these managers for the study not because they necessarily represent all university administrators, but because they occupy particular job titles which are potentially influenced by the external environment. These 120 universities are the ones that agreed to participate in the study and they represent approximately half of all the nation's doctoral granting universities. The totals across the tables are not completely congruent because not every respondent completed every item on the survey. The greatest representation of administrative respondents is from the "Director" rank and the "Business and Finance" functional area. Additionally, two-thirds of the respondents are between ages 45 and 60 and 75% are male. Most have a doctoral or masters degree.

Analytic Procedures

The study uses principal components analysis to collapse the survey items into a smaller number of scales that reflect the concepts in the literature and that are congruent with the previous study of public universities. The internal consistency of each scale is tested using Cronbach's Alpha. Once the scales and individual measures were identified, we examined the data using descriptive statistics and compared the responses from those in public versus private universities. We identified five dimensions of administrative job satisfaction. In order to assess any differences in satisfaction between public and private administrators, separate OLS stepwise regression equations were constructed for each of the five types of satisfaction for public and for private universities. This enabled us to examine and compare the influences on each satisfaction dimension identified in the research literature and empirically derived from our survey data.

Results

Do administrators in public and private universities experience different levels of satisfaction? Table 3 compares the public and private university responses on each of the five dimensions of administrative job satisfaction. On four of the five satisfaction dimensions, there are no significant differences in the mean responses and standard deviations of the public and private sector respondents. Both groups are most satisfied with the intrinsic rewards of their positions (3.9 to 4.0 on a 5-point scale). Both groups are least satisfied with their extrinsic rewards and work conditions (3.2 to 3.5 on a 5-point scale). The largest and only significant difference between the two groups of administrators occurs on the extrinsic rewards dimension (salary, benefits, promotion), where the private university group is significantly more satisfied than the public. Thus, we find differences between the two groups that are smaller than one might expect from reading the literature.

Are the influences on administrative job satisfaction similar or different in public versus private universities? Table 4 shows the results of the multivariate analysis. For each of the five dependent measures the beta weights for the public and private regression models are displayed side-by-side.

The first two columns show the beta weights from the OLS regression models using overall satisfaction as the dependent measure. In both the public and the private models, the largest influence on overall satisfaction is interpersonal conflict, followed by teamwork. In other words, controlling for all other variables, an absence of interpersonal conflict and an atmosphere of teamwork account for most of the explained variance in overall satisfaction among both populations. The private university model is especially robust with an R-square of .39. In the public university model(R-square=.27), two other variables exert a lesser but significant negative influence on satisfaction – a controlled work environment and workload/time pressure.

The second pair of columns in Table 4 presents the results of the intrinsic satisfaction models where the public university model obtained a total R-square of .31 and the private university model obtained an R-square of .40. In both columns the largest beta weight is the negative influence of interpersonal conflict. In the public university model, intrinsic satisfaction is associated additionally with teamwork(.26) controlled work environment (-.17), age(-.11), and rank(-.09). This indicates that respondents are more satisfied if they are in work situations without interpersonal conflict, if they are involved in teams, if they occupy less controlled work environments, if they are younger, and if they have higher administrative rank. In the private university model, intrinsic satisfaction is additionally associated with rank(-.23) with teamwork(.21), and with female(-.18). Thus private university respondents are more satisfied if they are involved in teams, are male, and have a higher administrative rank.

The third pair of columns in Table 4 presents the results of the extrinsic satisfaction models where the public university model obtained a total R-square of .17 and the private university model obtained an R-square of .23, results that are less robust than the other models in the table. The private university model is the least complex in that satisfaction with extrinsic rewards is significantly associated with only two variables: interpersonal conflict and rank. Among these respondents, the absence of interpersonal conflict(-.40) is almost twice as important as a high rank (-.26). In the public university model, extrinsic satisfaction is also associated with rank(-.17) and interpersonal conflict (-.16), but several other variables play a significant role. Among these are undergraduate quality(.12), having a medical complex(.10), female(-.08), highest degree(-.08), being in academic affairs(.13), teamwork(.15), and campus funding(-.12). This indicates again that respondents are more satisfied if they are in work situations without interpersonal conflict, if they are involved in teams, and if they have higher administrative rank.

The fourth pair of columns in Table 4 presents the results of the models for satisfaction with work conditions where the public university model obtained a total R-square of .42 and the private university model obtained an R-square of .54. These are the most robust models in our analysis. In the private university model, satisfaction with working conditions is most strongly associated with interpersonal conflict(-.44), followed by workload and time pressure(-.36) and teamwork(.19). The same variables are significant in the public university model with similar beta weights, but one other variable exerts a lesser but significant negative influence on satisfaction – campus funding. However, the bottom line here is that both public and private university respondents are more satisfied if they are free of interpersonal conflict and undue workload pressure, and are involved in teams.

The fifth and last pair of columns in Table 4 presents the results of the satisfaction models for relationships with others. The public university model obtained a total R-square of .22 and the private university model obtained an R-square of .26. The private university model is the least complex in that satisfaction with the people one encounters on the job is significantly associated with only two variables: interpersonal conflict(-.40) and teamwork(.22). Among these respondents, the absence of interpersonal conflict is almost twice as important as a working atmosphere of teamwork. In the public university model, satisfaction is again associated most strongly with interpersonal conflict (-.29) and teamwork (.19), but several other variables play a significant role. Among these are campus size(-.17), faculty quality(.10), undergraduate quality(.10), having an agricultural college(.08), being in academic affairs(.13), and perceiving a climate of regulation(-.08).

Discussion and Conclusions

This is the first study in higher education to compare administrative satisfaction among public and private university managers. We collected survey data from 1200 administrators ranging from Presidents and Vice Presidents to Directors and Assistants, and derived five dimensions of satisfaction. We found more similarities than differences between the two populations. There are no statistically significant differences between public and private university administrators in the levels of overall satisfaction, satisfaction with intrinsic rewards, satisfaction with working conditions, and satisfaction with the people they come in contact with in their work. Only in the area of extrinsic rewards do private university managers report significantly more satisfaction. Both groups on average are above the midpoint of the 5-point response scale on all five satisfaction dimensions, and both groups report being most satisfied with the intrinsic rewards of their jobs and least satisfied with the extrinsic rewards and work conditions.

While public administration research suggests that there are significant differences between the public and private sectors with respect to levels of satisfaction, there is little evidence in this university population apart from pay and benefits that confirms this hypothesis. Even the satisfaction differences for extrinsic rewards (3.23 versus 3.47 on a 5-point scale), while statistically significant, are hardly dramatic and do not translate into differences regarding overall satisfaction.

In the multivariate analysis we examined the causes of satisfaction and dissatisfaction. Our analysis suggests that work place relationships and an atmosphere of teamwork are almost universally important contributors to every dimension of administrator satisfaction. This finding supports the scholarship that emphasizes teamwork and cooperative work arrangements (Bensimon and Neuman, 1993). It is also consistent with Hagedorn's recent research (1996) showing that interpersonal relationships positively influence job satisfaction and also lessen job-related stress.

Other variables in the study are associated with specific dimensions of satisfaction. For example, holding a higher administrative rank is significantly associated with both intrinsic and extrinsic satisfaction in both populations. The pressures of workload and time significantly reduce satisfaction with working conditions in both populations. In public universities, campus size tends to reduce administrator satisfaction with the quality of their relationships with others in the work place, and undergraduate quality tends to promote satisfaction in two of the models.

In general, however, few of the campus characteristics seem to influence administrative satisfaction for either population and neither of the two autonomy measures exerts an influence anywhere in the study. This finding contradicts the literature on campus autonomy, but is consistent with the previous study by Volkwein, Malik, and Napierski-Pancl (1998).

This study does not explore the relationship between job satisfaction and other important outcomes, such as turnover and productivity. However, understanding the nature of job satisfaction in higher education and any significant differences across sectors is an important first step to exploring this question further. Additionally, ample literature on job satisfaction alerts managers in all sectors to the **potential** importance of job satisfaction. In this regard, higher education administrators and policy makers need to consider the implications for job satisfaction as various "reforms" and management techniques find their way into the work place. Clear and consistent evidence from this study and the previous one (Volkwein et al., 1998), indicate the importance of a work environment that is team oriented and free from interpersonal conflict. The sources of stress and conflict in this study include turnover, job security, interpersonal relations with supervisors and colleagues, and lack of personal respect. Efforts to "rightsize" and "restructure" higher education institutions without regard for the effect on work units or teams have potentially dire consequences for the levels of satisfaction, on all dimensions, experienced by administrators.

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Factors Affecting Academic Outcomes Of Underprepared Community College Students

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Introduction

Underprepared college students are students with basic deficiencies in academic skills necessary for the satisfactory completion of college-level course work. As a major academic support mechanism, developmental education provided for such students has long become an important component of instructional activities at many American colleges and universities. This is especially so with public 2-year institutions, where 41 percent of the freshmen enrolled in developmental courses nationwide in fall 1995 (USDE, 1996b). At Maryland community colleges, this figure reached almost 60 percent during the 1994-1995 academic year (Maryland Higher Education Commission, 1996). Given the diminishing resources for higher education in the recent decades, the increasing demand for developmental education has evoked a controversy as to whether or not colleges and universities should end or limit remediation after high school (Ignash, 1997). While this debate may well continue into the next millennium, institutional researchers at community colleges can at least be certain of one thing right now: With the expected 16 percent enrollment increase in higher education over the next ten years (USDE, 1996a) as well as the open-admissions policies of community colleges, the underprepared student population on our campuses is most likely to increase in the foreseeable future, and institutional researchers will more frequently find themselves involved in the evaluation of developmental education programs in response to accountability demands.

Prince George's Community College (PGCC) is a comprehensive community college in Prince George's County, Maryland that enrolls approximately 12,000 credit students each fall and spring semester. Reflecting the demographic characteristics of the county, some 70 percent of our students are African American. To ensure that our new entrants are fully prepared for college studies, they are required to demonstrate their basic academic skill proficiencies in reading, writing, and mathematics when seeking credit course enrollment for the first time. Students can do this either through placement testing or through developmental course completion. Past records indicate that the percentage of underprepared students identified by placement testing has been consistently high. The Office of Institutional Research and Analysis (OIRA) at the college conducted a research in 1995 to investigate the four-year academic outcomes of the underprepared students in the fall 1990 freshmen cohort. The findings of the research subsequently helped the college administration take new initiatives to improve the academic progress rates of these students. This summer, a research project was carried out at OIRA to revisit the issue of underprepared students' academic outcomes. By taking the academically deficient students in the fall 1994 freshmen cohort as a sample, the current study was expected to identify the factors affecting their academic achievement so that measures could be taken to help these students really benefit from the democratic access to higher education in this nation.

Literature Review

Astin's (1991, 1996) input-environment-outcome (I-E-O) model has provided an important conceptual framework for studying academic outcomes in higher education. In his terminology, *inputs* refers to the personal characteristics the student initially brings to the institution, including the level of talent the individual previously developed. *Environment* refers to the student's actual educational and non-educational experiences at the institution that are associated with various programs, policies, faculty and peers. *Outcomes* refers to the "talents" that the institution seeks to cultivate in the student. By focusing on the change or growth in the student after being exposed to the environment, this model enables the faculty and administration to find the type of environmental conditions that may best facilitate the development of student talents.

A presentation of academic assessment theories will be incomplete without the mention of models for studying student retention, mainly because these models invariably include academic outcomes as an important intervening construct affecting the student's decision to persist or not. Tinto's (1975, 1987) attrition model is probably the most popular theoretical framework whenever student retention becomes of research interest. In Tinto's view, the student enters the institution with a spectrum of background attributes and high school experiences that lead to the individual's educational goals and initial commitment to the institution. Together, these factors influence the way the student interacts with, and gradually integrates into the academic and social systems of the institution. The degree of academic integration and social integration in turn changes the student's initial commitment to the institution, which eventually makes the individual persist or exit from the college. Largely based on the notion of person-environment fit, Tinto's model is especially helpful in locating problems in the interwoven systems of student retention.

Considering the unique characteristics of the growing number of nontraditional students on college campuses in recent decades, Bean and Metzner (1985) proposed a new student attrition model to explain the withdrawal decisions of these older, part-time, and commuter students. Partly derived from Tinto's (1975) traditional student attrition model, Bean and Metzner's model states that the phenomenon of nontraditional student attrition can be accounted for by four sets of variables: the individual's poor academic performance, intent to leave as a function of psychological outcomes and academic variables, background and defining variables, and environment variables. Noticeably, the two researchers omitted social integration as a primary component of the model based on the empirical data, and acknowledged the compensatory impact of environmental factors for the negative influence of the academic variables. Apparently, Bean and Metzner's model can better address the student retention issue at community colleges than Tinto's model.

In the last ten years or so, a considerable number of studies have been carried out by individual institutions or government agencies to assess the academic outcomes of underprepared community college students (*e.g.*, Haeuser, 1993; Maryland Higher Education Commission, 1996; Schoenecker, Bollman, & Evens,1996; Seybert & Soltz, 1992; Sinclair Community College, 1995). While most of these studies were descriptive in nature, there emerged some inferential statistics-based research projects that utilized recognized outcomes assessment and student attrition models to varying degrees.

Long and Amey (1993) applied Astin's (1991) I-E-O model to the study of student success with a sample of underprepared students at Johnson County Community College in Kansas. Using a one-way multivariate analysis of variance (MANOVA) with a follow-up discriminant analysis, the two researchers were able to identify two input variables (reading scores and reading placement level, and high school GPA), one environmental variable (number of first term credit hours), and two output variables (highest developmental English course completed and nondevelopmental GPA) that could best distinguish the successful and unsuccessful groups of these underprepared students.

In an example of the application of Astin's (1991) I-E-O model as well as Tinto's (1975, 1987) and Bean and Metzner's (1985) student attrition models, Campbell and Blakey (1996) assessed the impact of early remediation on the persistence and/or performance of underprepared students at a midwestern, suburban community college. Results from a regression analysis indicated that cumulative GPA, number of remedial courses, early remediation, first year remedial course taking, and a degree-seeking intent all significantly impacted student persistence. It was also revealed that age, ethnicity, gender, and a degree-seeking intent were significant predictors of the academic performance of underprepared students.

At PGCC, Boughan (1995) conducted a comprehensive analysis of the developmental placement and academic progress issue by tracking underprepared students in the fall 1990 entering cohort. In a related study, Boughan and Clagett (1995) examined the four-year academic achievement of the whole cohort by means of logistic regression analysis. Although not explicitly model-based, they incorporated into their research design previous findings in the model-related outcomes assessment literature. Findings form this study suggested that significant predictors of academic achievement of degree-seeking students, prepared and underprepared alike, included cumulative GPA, summer session attendance, curriculum change, good academic standing, average credit hour load, remediation completion, first-year average credit hour load, developmental course taking, no curriculum choice, first-year good academic standing, immediate entry from high school, enrollment in hi-tech or allied health programs, and under 21 years of age. In the sequel, Boughan (1997) used path analysis to model the academic performance of community college students, thus effectively verify the findings from the Boughan and Clagett (1995) study.

An inspection of the literature on the academic outcomes of underprepared community college students shows that cumulative GPA is probably the best predictor of the academic success of these students. It also shows that, despite the apparent theoretical and empirical gains form model-, and inferential statistics-based studies, such research endeavors are still insufficient in number, if we take into consideration the mere size of the target student population nationwide who would enjoy the benefit of any policy change at their institutions resulting from the findings of our studies. Therefore, for both our better understanding of the factors affecting academic outcomes of these students and any potential improvement we can bring to developmental education programs, institutional researchers at public 2-year colleges should devote more time and effort to the study of this assessment issue.

Method

Subjects

The subjects for this study (N=1,249) were all the fall 1994 degree-seeking first-time entrants at PGCC who took the placement testing, and were identified as academically deficient in at least one of the three areas: reading, writing, and mathematics. Following the PGCC student outcomes typology as presented in Boughan and Clagett (1995), subjects were defined as achievers if they had earned a degree or certificate from the college, or transferred to a senior college, or earned at least thirty credits with a cumulative GPA of 2.0 or above, by the end of summer session 1, 1998. The remaining subjects, whether they still enrolled at the college in spring 1998 or not, were all regarded as nonachievers. To assess their academic performance and outcomes between their first semester and summer session 1, 1998, the end-of-semester student records maintained by the college information systems for the corresponding semesters were reviewed, and the relevant information was extracted.

Research Design and Data Analysis

This study was designed under Astin's (1991, 1996) I-E-O model. Although this model explores the three relationships among the model components: inputs and environment, environment and outputs, and inputs and outputs, the relationship between inputs and environment was not examined in this study for its lack of immediate research interest. To answer the research question as to whether there existed a nonlinear combination of input and environmental variables that could effectively determine the binary outcome status of the subjects, logistic regression analysis with likelihood-ratio-based forward stepwise selection was selected as the major statistical method for the study. SPSS for windows Release 8.0 was used for the analysis, which involved a total of thirty-one variables based on the literature on outcomes assessment and student attrition, with academic outcomes as the dependent variable. Table 1 summarizes the relevant information of these variables. There were 15 percent of missing values with the variable B90. They were replaced with their estimates by employing the linear trend at point method as implemented in SPSS.

Table 1.
Name and Type of Variables for Logistic Regression Analysis

Input Variables

AGE: Age (Continuous)
SEX: Gender (Binary, male=0, female=1)
RACE: Race/ethnicity (Binary, white=0, nonwhite=1)
HSTYPE: High school type (Ordinal, PG private school=1, elite PG public school=2, other PG public shool=3, other school=4)
B90: Social economic status (Ordinal, a 15-category scale based on Boughan & Diehl (1995).
ENTDLAY: Delayed entry (Continuous)
DVE944: Dev. English required (Binary, yes=1, no=0)
DVM944: Dev. math required (Binary, yes=1, no=0)
MPLUS: Dev. math and another develop. area required (Binary, yes=1, no=0)
DVR944: Dev. reading required (Binary, yes=1, no=0)
EFL944: English as a foreign language required (Binary, yes=1, no=0)
DVTOTL: Number of dev. areas required (Continuous)

Environmental Variables

CURCH: Percent. of semesters with curriculum change (Continuous)
GOALCH: Percent. of semesters with attendance goal change (Continuous)
REASONCH: Percent. of semesters with attendance reason change (Continuous)
TERM: Number of semesters attended (Continuous)
MJ3TERM: Number of first three major semesters attended (Continuous)
SMTERM: Number of summer semesters attended (Continuous)
LOADMJ: Average major semester credit hour load (Continuous)
SITES: Percent. of semesters with combined attendance locations (Continuous)
SCHS: Percent. of semesters with combined attendance schedules (Continuous)
CDY1: Cumulative first-year credit hours earned (Continuous)
CDEN: Cumulative credit hours earned (Continuous)
GPA: Cumulative GPA (Continuous)
DISPG: Percent. of semesters with good academic standing (Continuous)
DVCRS944: Number of dev. courses taken in fall 1994 (Continuous)

Table 1. (Continued)
DVCRS: Number of dev. courses taken since fall 1994 (Continuous)
DVGDPP: Percent. of dev. courses taken with passing grade (Continuous)
DVCOMP: Number of dev. areas completed (Continuous)
FAID: Percent. of semesters with financial aid (Continuous)
Outcome Variable
OUTCM: Academic outcomes (Binary, achiever=1, nonachiever=0)

Results

The likelihood-ratio-based forward stepwise variable selection terminated at step 6 in the logistic regression analysis when no more variables met entry or removal criteria. Table 2 provides descriptive statistics of the five environmental variables in the final model (RACE is excluded from the table for its binary nature).

Table 2.
Descriptive Statistics of Selected Environmental Variables
(N=1,249)

Variable Name	Mean	Std. Deviation
LOADMJ	8.7	3.2
CDEN	16.8	19.8
GPA	1.6	1.2
DISPG	.6	.4
DVCRS	2.0	1.8

The goodness of fit of the regression model was satisfactory. Table 3 indicates that this model had an overall 94.96 percent correct prediction rate. Table 4 presents the change in -2LL statistic from the initial model containing the constant only before step 1 to the final model after step 6. As another measure of how well the estimated model fits the data, -2LL is the product of -2 times the log of the likelihood with the value of 0 for a perfect match. The decrease of its value from 1124.97 before step 1 to 331.22 after step 6 should be regarded as a significant improvement. The difference between the two -2LL values is listed in Table 4 as the model chi-square, and the step chi-square represents the change between the last two steps. For these two chi-squares, their degrees of freedom (df) and significance level (Sig) are also presented.

Table 3.
Classification Table for OUTCOM

Observed	Predicted		Percent
	Yes	No	Correct
Yes	168	40	80.77%
No	23	1,018	97.79%
		Overall	94.96%

Table 4.
Goodness of Fit for the Regression Model

Name	Value	df	Sig
-2 LL before step 1	1124.97		
-2LL after step 6	331.61		
Goodness of Fit	992.61		
Model Chi-square	793.74	6	.00
Step Chi-square	5.78	1	.02

Table 5 displays the parameter estimates for the six variables in the final model and their related statistics. They include the estimated regression coefficients (B) and standard errors (S.E.), the Wald statistic for testing hypotheses about the coefficients (Wald) and degrees of freedom (df) and significance level (Sig), the R statistic for measuring the partial correlation between the dependent variable and each of the independent variables, and the odds of an event occurring (Exp(B)). Of the six significant predictors of the academic outcomes of the underprepared students, CDEN (R=.35) and GPA (R=.17) were more closely related to the dependent variable OUTCM, and DISPG (Exp(B)=19.47) could change the odds of becoming an achiever most dramatically. Interestingly, there was a negative coefficient for DVCRS, revealing a negative relationship between the number of developmental courses taken and the academic outcomes.

Table 5.
Parameter Estimates for the Regression Model

Variable	B	S. E.	Wald	df	Sig	R	Exp(B)
CDEN	0.15	0.01	135.95	1	0.00	0.35	1.16
DISPG	2.97	1.11	7.17	1	0.01	0.07	19.47
GPA	1.60	0.28	32.94	1	0.00	0.17	4.94
LOADMJ	0.20	0.06	13.01	1	0.00	0.10	1.23
DVCRS	-0.19	0.08	5.50	1	0.02	-0.06	0.83
RACE	1.28	0.42	9.43	1	0.00	0.08	3.59
Constant	-14.73	1.60	84.43	1	0.00		

Discussion

The results from the logistic regression analysis verified some findings of previous research that cumulative credit hours earned, good academic standing, cumulative GPA, course load, and the number of developmental courses taken have varying degrees of impact on the academic progress of underprepared community college students (Boughan & Clagett, 1995; Campbell & Blakey, 1996; Long & Amey, 1993). As most of the variables remained in the final logistic regression model reflected the environmental experiences of college students in general, some people may be tempted to suggest that this model may not well explain the academic outcomes of underprepared community college students. This, however, may not be true. First, whether the student is prepared or underprepared for college-level course work, the outcomes of the individual's academic endeavors bear some common characteristics that can be evaluated by measures such as course load, GPA, and academic standing. Second, with increasingly vigorous enforcement of mandatory placement in developmental education courses, the mere attainment of some GPA points and credit hours marks an underprepared student's upward movement from developmental courses to college-level courses, since developmental courses do not carry credit toward a certificate or a degree in general. There is some obvious cohesion among four out of the six predictors in the logistic regression model: With an adequate course load in major semesters (LOADMJ), an underprepared student is expected to earn more credit hours (CDEN); as the number of credit hours grows almost simultaneously with the individual's academic level, the student is more likely to have a higher GPA and to remain in good academic standing (DISPG). There is only one academic predictor in the model that directly measures the effect of developmental education (DDVCRS). The regression coefficient is negative because the number of developmental courses taken since fall 994, whether conscientiously or not, shows the severity of the student's academic deficiencies. An interesting finding from this study was that race/ethnicity, the only input variable in the logistic regression model, was positively related to academic outcomes. Since white and non-white students were coded as 0 and 1 respectively for the data analysis, it might be inferred that minority underprepared students fare better in developmental education, and subsequent college-level education programs. Although researchers (e.g., Gates & Creamer, 1984; Losak, 1983) have found that black community college students were better persisters than their white peers, this difference in academic outcomes has not been substantiated with empirical data.

It might be argued that Astin's (1991, 1996) I-E-O model was not fully supported by this study. This could be an artifact of the practical constraints that limited the way the data were collected for the study. For example, the two variables HSTYPE and B90, were both useful input variables. However, since these measures were based on groups (*i.e.*, schools and neighborhood) rather than on individual persons, the within-group variation of these variables were unavoidably suppressed. Also, our research office relies on the Transfer Student System of Maryland Higher Education Commission for transfer student information. Yet this system can only identify PGCC students who transferred to a Maryland 4-year public post-secondary institution with at least twelve credits about a year ago. As a result, some "dropouts" in our student database with high GPAs might be real achievers who may have long transferred to a private institution or an out-of-state institution. There were other factors that may have affected the results of this study. Because of the limited resources, we were not able to conduct a comprehensive model-based student survey to collect data. Besides, our selection of only underprepared students as the target of our research might methodologically nullify the use of some developmental education-related variables in our analysis.

Conclusion

A recent logistic regression analysis of the longitudinal data of the underprepared students in the fall 1994 PGCC new entrants identified six significant predictors of these students' academic outcomes. As the predictors were largely academic, it seems that the underprepared students should be encouraged to work harder, and to persist at the college. The current academic achievement rate of PGCC underprepared students is low. However, with our devoted faculty, administration, and Educational Development Program personnel, the situation is improving. The college will continue to enroll a large number of underprepared students, yet it will never become a remedial education institution (Bickford, Clagett, James, & Taibi, 1998).

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NEAIR 25th Anniversary Conference

Saturday, November 14, 1998	
1:00 – 5:00 p.m. *Nicholas Moore*	**Conference Registration**
2:00 – 5:00 p.m. *Reynolds* Karen Bauer Assistant Director of Institutional Research and Planning University of Delaware NEAIR President-elect	**Newcomers to Institutional Research, Part 1** This workshop is designed for new practitioners who engage in IR activities. Using the AIR monograph, Strategies for the Practice of Institutional Research, the workshop addresses key components of IR including defining critical issues for institutional research, identifying sources of data, developing factbooks and other reports, and conducting effective survey research for assessment and evaluation. The main focus is a presentation of general concepts and practical strategies for the implementation of continued development of effective IR at many schools, regardless of size or type. Workshop
2:00 – 5:00 p.m. *Flower* Anne Marie Delaney Director of Institutional Research Babson College	**Research Design Ideas for Institutional Researchers** The goal of this workshop is to enhance institutional researcher's ability to translate data into information and to transform reporting into research. Objectives include enabling participants to prepare methodologically sound research reports for their institutions and research proposals for professional conferences. The workshop will demonstrate how the institutional researcher can use principles of research design and selected research techniques to transform data collection activities into meaningful research projects. Ideas for the workshop will be based on research projects completed by the presenter as well as on actual or proposed studies of interest to the participants. Workshop

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Saturday, November 14, 1998 continued

2:00 – 5:00 p.m. *Ballroom E1* Craig Billie Associate for Institutional Research State University of New York, System Administration Linda LeFauve Director of Institutional Research Davidson College	**An Introduction to Statistical Sampling Studies** From opinion surveys to election polls to (possibly) the next decennial census, examples of statistical sampling studies abound in social science and educational research. This workshop will cover the basic types of sampling designs, address the determination of sample size, and examine the issue of bias due to non-response. These topics will be developed using specific sampling studies the presenters have conducted at their respective institutions. Workshop
2:00 – 5:00 p.m. *Temple University* Robert Toutkoushian Executive Director Office of Policy Analysis University System of New Hampshire	**IR Applications of Regression Techniques** The workshop will illustrate some of the ways in which regression techniques can be applied to institutional research. Techniques to be reviewed include multiple regression, logit and probit analysis and poisson regression. Some familiarity with statistics and regression analysis will be assumed for participants. The workshop will focus on how to apply these techniques. Workshop
2:00 – 5:00 p.m. *Temple University* William Lauffer Department Chair, Engineering Technology Prince George's Community College	**Creating a Web Page Using Netscape** Learn how to create a home page without writing HTML code or using an expensive software package. You will learn how to use Netscape's editor (included with the 3.0 Gold and 4.0 versions) to display text, images, and backgrounds. You will also learn how to create links to other pages at your own site and around the World Wide Web. You are guaranteed to leave the workshop with a working home page. We will provide sample files and images for you to work with, but you may wish to bring your own (in *.jpg or *.gif format). Workshop

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Saturday, November 14, 1998 continued	
6:00 – 7:00 p.m. *Hamilton*	**Newcomers' Orientation and Reception**
Sunday, November 15, 1998	
8:00 a.m. – 4:30 p.m. *Foyer*	**Registration**
9:00 a.m. – noon *Reynolds* Karen Bauer Assistant Director of Institutional Research and Planning University of Delaware **NEAIR President-elect**	**Newcomers to Institutional Research, Part 2** Continuation; Part 1 is a pre-requisite. Workshop
9:00 a.m. – noon *Flower* Ed Silverman Director, Institutional Research City College of New York	**Survey Production Mechanics** Recently, college administrators, professors and government agencies want IR to "do a survey." This workshop will show how a one-person office uses available computer technology to create, scan, analyze, and report on surveys. Workshop

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Sunday, November 15, 1998 continued

9:00 a.m. – noon *Ballroom E1* Michael Middaugh Assistant Vice President for Institutional Research and Planning University of Delaware **1989-90 NEAIR President**	**Developing Appropriate Measures of Teaching Workload** This workshop provides a "nuts and bolts" discussion of concrete strategies for building a campus data base that lends itself to a thorough analysis of faculty teaching loads, instructional costs, and research and service activity. The Boyer Commission on Educating Undergraduates in Research Universities recently decried the quantity and quality of undergraduate contact with tenured and tenure track faculty at those institutions, suggesting they are not getting full value for their tuition dollar. Less harsh, but still real comparable criticism has been directed at all of higher education, especially with regard to costs. With growing external pressures for greater accountability from higher education, it is imperative that institutions be able to respond to the question, "Who is teaching what to whom, and at what cost?" This workshop provides the necessary tools for responding to that and other questions currently being directed at colleges and universities. Workshop
9:00 a.m. – noon *Temple University* Heather M. Barnes Information Technologist II Keene State College	**Designing Professional Presentations Using Microsoft Power Point** This workshop is designed for the institutional research professional who would like to learn how to design effective computerized presentations. This introductory session using Power Point for Office97 will include everything the participant needs to start creating great presentations, including animation, graphics, presenter's notes, handouts, and saving as HTML. Workshop

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Sunday, November 15, 1998 continued

9:00 a.m. – noon *Temple University* Mary Ann Coughlin Professor of Research & Statistics Springfield College	**Statistics for Institutional Research** Basic ideas in statistics will be covered in a way useful as an introduction or as a refresher to statistics. Descriptive statistics, sampling and probability theory as well as the inferential methods of chi-square, t-test and Pearson's r will be covered. May be taken with or without the follow-up advanced workshop. Workshop
Noon – 1:00 p.m. *Ballroom D*	**Lunch break**
1:00 – 4:00 p.m. *Reynolds* Craig Clagett Director of Institutional Research and Analysis Prince George's Community College **1997-98 NEAIR President**	**Office Management and Information Dissemination Strategies for New Directors of Institutional Research** Designed for institutional researchers, who have recently become directors, this workshop focuses on office management strategies and techniques for effective information dissemination. To maximize IR impact, we need to know our institutions and their decision environments, operate efficiently to create the time for policy-focused research, and communicate timely, targeted intelligence. Topics covered include environmental scanning, office staffing, staff incentive and recognition programs, office project management systems, principles of tabular and graphical data presentation, print and electronic reporting, and office Websites. Workshop

NEAIR 25th Anniversary Conference

Sunday, November 15, 1998 continued

1:00 – 4:00 p.m. *Flower* Michael McGuire Director of Institutional Research Georgetown University **1993-94 NEAIR President** Jim Trainer Director, The Higher Education Data Sharing Consortium Franklin and Marshall College	**Making Effective Inter-institutional Comparisons** In this workshop the presenters will discuss the various aspects of making effective inter-institutional comparisons. The workshop will cover topics ranging from selecting appropriate peer groups to accessing comparative data and ultimately using these data effectively to inform the planning and decision-making process. The value of inter-institutional cooperation in sharing data also will be discussed. Workshop
1:00 – 4:00 p.m.Ballroom E1 Lynn Atkinson Senior Research Analyst & Enrollment Coordinator Jack Keil Research Analyst Peter Partell Research Analyst Binghamton University	**Using SAS to Automate Data Presentation on the Web** Providing data is one of the most important and time consuming services provided by IR offices. This workshop shows SAS users how to present data on the Web. Participants will learn how to use SAS to create customized HTML pages that include stylish features such as backgrounds, graphics, and hyperlinks. Upon completion of the workshop, participants will possess the tools and knowledge to automate data presentation at their home institutions. Knowledge of HTML is beneficial but not required. Workshop

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Sunday, November 15, 1998 continued	
1:00 – 4:00 p.m. *Temple University* Hui-May Chu Research Analyst University of Connecticut	**How to Customize Reports using Excel Automation** This workshop is designed to help participants enhance their Excel skills and consists of examples of interest to institutional researchers. Techniques will be shared that reduce duplication of data storage, simplify formatting, and increase efficiency and accuracy in production of tables and graphs from a set of templates. The workshop will be divided into three modules: (1) Introduction of cell linkages, formulas, and graphs in Excel; (2) Design of templates and the how-to of visual basic macros; and (3) Discussion and advice for specific projects of participants. Both simple examples and complicated setups will be illustrated. The intended audience should have working knowledge of Microsoft Excel. Participants will have hands-on experience of macro writing for their specific projects. Workshop
1:00 – 4:00 p.m. *Temple University* Mary Ann Coughlin Professor of Research and Statistics Springfield College	**Advanced Statistics for Institutional Research** This workshop will deal with advanced issues in inferential statistics. Topics such as Analysis of Variance, Factor Analysis, Multivariate Regression, and Logit/Probit models will be covered and contrasted with other statistical tools and techniques. A case study approach will be used illustrating applications of these statistical techniques in institutional research. Open to those who have completed the introductory workshop on Sunday morning or who have an equivalent background. Workshop

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Sunday, November 15, 1998 continued

4:00 – 4:50 p.m.	**Special Interest Groups**
Reynolds Ellen Kanarek Vice President Applied Educational Research, Inc. **1995-96 NEAIR President**	**Admitted Student Questionnaire**
Flower Alan Sturtz Director, IR and Planning Gateway Community-Technical College	**National Council for Research and Planning - Two-year Colleges**
Ballroom E1 Jim Trainer, Director HEDS Consortium	**Higher Education Data-Sharing Consortium**
Ballroom E2 Michael Middaugh Assistant Vice President for Institutional Research and Planning University of Delaware **1989-90 NEAIR President** William R. Fendley Director, Institutional Research University of Alabama **AIR President**	**The Delaware Study**

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Sunday, November 15, 1998 continued

5:00 – 6:00 p.m. *Ballroom A & B* William J. Flynn Dean, Division of Media, Business & Community Services Palomar College	**The Learning Paradigm and Institutional Transformation** Rarely has an analysis of higher education provoked as much discussion and debate as an article that appeared in the November/December 1995 issue of Change magazine. It's title: From Teaching to Learning – A New Paradigm For Undergraduate Education. The article outlined the changes in mission, vision and structure necessary to create a learner-centered college. This session reviews the main tenets of the Learning Paradigm, and offers insight into the tools and techniques that could be used to begin an institutional transformation. Implications for budgeting decisions, facilities design, strategic planning and academic revitalization will be addressed. Opening General Session
6:00 – 7:00 p.m. *Foyer*	**Presidents' Reception**
7:00 – 9:00 p.m. *Ballroom C, D, & E*	**Banquet and Entertainment**

NEAIR 25th Anniversary Conference

Monday, November 16, 1998	
8:00 – 11:00 a.m. *Foyer*	**Registration**
7:30 – 8:50 a.m. *Ballroom B, C, & D*	**Continental Breakfast** **(Note: Breakfast Workshares start at 8:00 a.m.)**
8:00 – 8:50 a.m. *Reynolds* Marianne Guidos Educational Data Specialist Harrisburg Area Community College Moderator: Craig Clagett	**Shaping Internet Courses at Harrisburg Area Community College: Assessing Student Interest** To assess student interest in courses offered over the Internet at Harrisburg Area Community College, credit, noncredit, and distance education students were surveyed. Results indicate nontraditional students were most interested in Internet delivery and the majority of students had both the computer experience and resources necessary to enroll. Workshare
8:00 – 8:50 a.m. *Flower* Judith A. Jaffe Policy Analyst Consultant Massachusetts Board of Higher Education Moderator: Michael Keller	**Do You Know What Those Numbers Really Mean? Understanding Financial Performance Indicators** Financial indicators are frequently incorporated into the performance measurement systems institutions use to determine if they are achieving their goals. Institutional researchers must familiarize themselves with the different indicators, their components, and their correct interpretation. This session will explore the meaning and use of the financial indicators used by public institutions in Massachusetts. Workshare

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Monday, November 16, 1998 continued	
8:00 – 8:50 a.m. *Cook* Sherri Noxel Statistical Information Specialist Barbara Wharton Coordinator, Office of Testing Ohio State University Moderator: Karl Boughan	**CIRP Data Representativeness: An Exploration of Response Differences Between Students Permitting Follow-up Research and Anonymous Respondents** Typically 53 percent of the freshmen at Ohio State University permit identification in the Higher Education Research Institute's Fall Freshman Survey. These data are increasingly important in longitudinal retention and degree progress research. Trackable student responses were analyzed and evaluated for differences in comparison to the total new student population. Workshare
8:00 – 8:50 a.m. *Bromley* Alan J. Sturtz Director, IR and Planning Gateway Community-Technical College Moderator: Kenneth Redd	**Outcomes and Effectiveness: The Mission, the Plan, the Measures** Assessment of institutional effectiveness must become more rational, more public, more systematic, and more consistently based upon data and other objective measures. Regional accrediting agencies are now mandating this. This workshare covers the what, why, who, how, and when of IE and provides one example of an assessment/effectiveness plan. Workshare
8:00 – 8:50 *Claypoole* Kim Dolphin Wheaton Coordinator of Institutional Research Bentley College Moderator: Catherine Watt	**The Survey Doctor is In: Extending your Reach through Internal Consultation Services and On-line Guidance** At Bentley College, the demand for institutional research services exceeds staff resources. Our solution: Extend our reach through targeted consultations and a detailed, on-line guide to the survey research process. The session will describe why this is a good idea, how it works, and how to share your expertise through technology. Workshare

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Monday, November 16, 1998 continued	
9:00 – 9:50 a.m. *Reynolds* Dawn Geronimo Terkla Executive Director, Institutional Research **1992-93 NEAIR President** Jennifer McKnight Research Analyst Tufts University Moderator: Sarah Parrott	**On-line News vs. Traditional Media: Student Preference Regarding the Acquisition of Current Events** In the summer of 1997 a contract was signed with Prentiss Hall to obtain university-wide access to College Newslink, a web-based newsclipping service with stories classified by academic discipline. As part of the license agreement, it was stipulated that the university would evaluate the product in terms of ease of access, reliability, desirability and usefulness. Simultaneously, there was interest on campus in determining how students prefer to receive their news information. In an era of limited resources, the question was being raised whether the university should use funds to provide multiple subscriptions to the New York Times or a daily electronic news service. This paper will describe how the institutional research office went about developing a strategy to evaluate College Newslink, assess students' preferences regarding the acquisition of current events, and the difficulties that were encountered along the way. Paper
9:00 – 9:50 a.m. *Flower* Joan McDonald Assistant Director of Institutional Research Barbara Sadowski Assistant to the President for Planning and Research Marywood University Moderator: Tara Maher	**The Impact of Outsourcing Auxiliary Enterprises on Strategic Indicators Involving Educational Costs** Research results will be presented from a study of factors contributing to educational costs in 100 private institutions. It was conducted to determine the extent to which strategic indicators can be affected merely by an institution's decision to outsource auxiliary enterprises. The relationship between outsourcing, allocation of indirect costs, and changes in total educational costs were investigated to determine the variables' relative contributions in predicting changes in total educational costs. Paper

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

9:00 – 9:50 a.m. *Cook* William J. Flynn Dean, Division of Media, Business and Community Services Palomar College Moderator: Bill Fendley	**The Learning Paradigm: Getting Started on Your Campus** This session will look at ways to start a campus dialogue on how colleges and universities must change to meet the new challenges of calls for accountability, the explosion of technology and increased competition. It will begin with a showing of the Palomar College award-winning video on the Learning Paradigm. The audience will be encouraged to discuss ways to involve campus constituencies in openly addressing issues of change and transformation. Workshare
9:00 – 9:50 a.m. *Bromley* Carolyn Hoffman Research Associate, Institutional Research and Planning County College of Morris Moderator: Jim Trainer	**Assessing the Effects of Basic Skills Policy Changes at a New Jersey Community College** With the demise of the New Jersey Department of Higher Education in 1994, public colleges and universities were granted autonomy in establishing basic skills placement procedures and curricula. This study utilizes data from the 1993 through 1997 cohorts to assess the effectiveness of a series of policy changes instituted by one New Jersey Community College. Paper

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Monday, November 16, 1998 continued

9:00 – 9:50 a.m. *Claypoole* Alan Sturtz Director of Institutional Research and Planning Gateway Community-Technical College Amy Kirle Lezberg Associate Director Commission on Institutions of Higher Education New England Association of Schools and Colleges Jean Avnet Morse Executive Director Commission on Higher Education Middle States Association of Colleges and Schools	**Accreditation Standards and Institutional Effectiveness** An increasingly important issue for both regional accrediting agencies and institutions of higher education is institutional effectiveness: assessing how effectively institutional resources are utilized and services delivered and how this measurement results in institutional improvement. Representatives from the NEASC and Middle States will discuss how they are implementing this concept in their standards, implications for colleges and universities and the possibilities for comparable standards across the regions. An open question and answer period will follow. Panel
10:00 – 10:50 a.m. *Reynolds* Michael McGuire Director of Institutional Research **1993-94 NEAIR President** Ronald Allan Manager, Data and Research Services Office of Student Financial Services Georgetown University Moderator: Richard Heck	**Comparative Financial Aid Measures for Consumer Audiences: What Prospective Students and Parents Really Need to Know** Consumer demand for information on college costs has led college guidebooks to focus on financial aid in well-intentioned but imprecise ways. This paper critiques current financial aid data collection and reporting methods, and proposes an alternative approach that appears to provide more useful information to prospective students and their parents. Paper

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

10:00 – 10:50 a.m. *Flower* Gayle Fink Coordinator of Institutional Research Michelle Appel Research Analyst Anne Arundel Community College Moderator: Barbara Sadowski	**IR's Role in the Development of a Technology Strategic Plan** Community college researchers will discuss their impact in creating a new Technology Strategic Plan. Information from a variety of surveys and data sources is being used to develop a comprehensive assessment of the college's technology needs and strengths. Additionally, IR's service on the planning workgroup will be discussed. Workshare
10:00 – 10:50 a.m. *Cook* Emily Thomas Director of Planning and Institutional Research Gayle Reznick Research Assistant SUNY Stony Brook Moderator: Robert Toutkoushian	**Using Predictive Models to Target Recruitment Initiatives: Theory and Practice** College admissions offices are experimenting with predictive modeling to target recruitment efforts, but a typical use of these models is theoretically questionable and may therefore be operationally inefficient. The results of an experimental program suggest that a different use of predictive modeling can be a fruitful collaboration between institutional research and admissions staff. Paper

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Monday, November 16, 1998 continued

10:00 – 10:50 a.m. *Bromley* Keith J. Guerin Director, Institutional Research and Planning County College of Morris Moderator: Paul Carmichael	**Tracking Community College Students to Bachelor's Degree Completion: Methodological Issues in Performance Funding** Performance funding has come to New Jersey, and bachelor's degree completion rates are a funding measure. Surprisingly, both community colleges and senior institutions are benchmarked for the same rates for their transfers. This paper examines empirical data and methodological issues associated with the validity of this performance indicator and its relationship to policy intent. Paper
10:00 – 10:50 p.m. *Claypoole* Cherry Danielson Research Associate, Research Office for Student Affairs University of Michigan Moderator: Jason Casey	**Quasi-experimental Design and the Pre-testing Effect** Although a conscientious effort to develop sound research designs must be a norm within institutional research, even the best-laid plans can result in the emergence of a pre-testing effect. This paper looks at an example of such a study and offers some practical ways to deal with the results. Paper
11:00 – 11:50 a.m. *Reynolds* Anne Marie Delaney Director of Institutional Research Babson College Moderator: Penny Blackwood	**Designing Graduate Admission Studies to Influence Campus Transformation** This paper presents the research design, significant results and strategic policy recommendations from a graduate admission study which examined the enrollment decision processes of students accepted to a newly redesigned Master of Business Administration (MBA) Program. The paper illustrates the role of institutional research in campus transformation by demonstrating how the study was used to evaluate the impact of curricular reform and the effectiveness of admission strategies in recruiting students to choose an innovative graduate degree program. Paper

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Monday, November 16, 1998 continued

11:00 – 11:50 a.m. *Flower* Ray Perry Computer Services Manager Cecil Community College Dan McConochie Director of Planning and Evaluation Howard Community College Moderator: Paula Pelletier	**Extracting Data from Our New Administrative Computer Systems** In the past three years, many colleges have purchased new administrative computer systems, typically SCT Banner or Datatel. These systems carry the promise of improved data retrieval and analysis tools over the legacy systems that they have replaced. This workshare will discuss strategies to take advantage of these new capabilities on a cooperative basis by sharing training and avoiding duplication of report programming. Workshare
11:00 – 11:50 a.m. *Cook* Michael F. Middaugh Assistant Vice President for Institutional Research & Planning University of Delaware **1989-90 NEAIR President** Moderator: Marian Pagano	**How Much Do Faculty Really Teach? Lessons Learned** This paper revisits an analysis done in 1996, using data from the Delaware Study of Instructional Costs and Productivity. That analysis found that tenured and tenure track faculty generate a much larger proportion of undergraduate teaching activity than might be expected in light of public criticism of American higher education. The 1996 methodology is replicated using data from the two most recent iterations of the Delaware Study. The result is a three-year trend line that more clearly indicates how much faculty really teach, and associated cost and productivity measures. Paper

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Monday, November 16, 1998 continued	
11:00 – 11:50 a.m. *Bromley* Denise Nadasen Coordinator, Institutional Research University System of Maryland Moderator: Indira Govindan	**Math Achievement and Math Course Taking** This research examines the math achievement scores and math course taking patterns of 16,000 12th graders selected form the National Educational Longitudinal Study of 1998. Using math achievement as the criterion variable and math course work as the predictor variables, the amount of explained variances attributable to specific math courses are identified. Results indicate that geometry contributes the most explained variances toward math achievement. Paper
11:00 – 11:50 a.m. *Claypoole* Kenneth R. Ostberg Director, Business Development National Student Loan Clearinghouse Moderator: Ellen Kanarek	**The National Student Loan Clearinghouse, TransferTrack and the Future** The session will discuss our experience with the first year of tracking transfers for Student Right-To-Know and IPEDS reporting purposes and Clearinghouse plans for the future for enriching the galaxy of research data that can be furnished to institutions and systems. Workshare
Noon – 1:30 p.m. *Ballroom B, C, & D*	**Luncheon and Business Meeting**
1:30 – 2:00 p.m. *Foyer*	**Networking and Vendor Exhibits**

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

2:00 – 2:50 p.m. *Reynolds* Karen W. Bauer Assistant Director, Institutional Research and Planning University of Delaware **NEAIR President-elect** Moderator: Becky Brodigan	**Description of the UDAES Project: A Study of Undergraduate Academic Experiences** Many IR officials are involved in assessing the academic transformations that occur on campus. This presentation describes the research design and findings from the first of a four-year research project, the University of Delaware Academic Experiences Study (UDAES). Data gathered from 265 students in May 1997 will serve as baseline measures for growth and change over the next three years. Workshare
2:00 – 2:50 p.m. *Flower* Wayne Obetz Research Associate Jane Grosset Director of Institutional Research Dana Cantu Research Assistant Bette Irwin Research Assistant Community College of Philadelphia Moderator: Robert Ploutz-Snyder	**From Database to Data Warehouse** This workshare will trace the development of a data warehouse at the Community College of Philadelphia from its initial conception as a database used to provide information to the program audit process to its present form, a tool capable of providing answers to both routine and unanticipated queries. Workshare

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

2:00 – 2:50 p.m. *Cook* J. Fredericks Volkwein Director of Institutional Research Kelli Parmley Doctoral Student University at Albany Shaukat Malik Assistant for Institutional Research SUNY Stoney Brook Moderator: Keith Guerin	**Comparing Administrative Satisfaction in Public and Private Higher Education** Do administrators in public higher education experience different levels of job satisfaction than their counterparts in the private sector? This study draws upon a comprehensive array of national data on university characteristics, state characteristics and administrative satisfaction. Previous analyses have explored the relationship of state regulation to administrative satisfaction in public higher education. However, there are few studies in the higher education management or public administration literature that have explored the differences in job satisfaction between the public and private sectors. Such research is important because of the connection in the literature between levels of satisfaction and employee productivity and managerial turnover. Paper
2:00 – 2:50 p.m. *Bromley* Tracy Polinsky Acting Assistant Director, Institutional Research and Planning Robert J. Brodnick Director, Institutional Research and Planning Shippensburg University Moderator: Mark Eckstein	**Transforming Your Campus: Mixed Methodology in Institutional Research** Researchers play crucial roles in campus transformation via information. This information must best represent their institution's reality. By combining quantitative and qualitative data collection methods, researchers can help isolate leverage points for change. This paper reviews multiple methods, discusses data integration, and gives an example where mixed methodological research induced successful transformation. Paper

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

2:00 – 3:30 p.m. *Claypoole* William R. Fendley Director, Institutional Research The University of Alabama **1998-99 AIR President** Timothy R. Sanford Director, Institutional Research University of North Carolina-Chapel Hill **1996-97 AIR President** Dawn Geronimo Terkla Executive Director, Institutional Research & Planning, Tufts University **1992-93 NEAIR President**	**The Association for Institutional Research *Code of Ethics*: A Message FOR and FROM the Membership** Adopted by the Association for Institutional Research (AIR) membership in 1992, the *Code of Ethics* represents a statement by the AIR for members concerning their competence, their professional practice, their responsibility to confidentiality, their relationships to the educational community and public, and their relationships to the craft and the profession. The intent of the AIR *Code of Ethics* was and is to establish guidelines of professional conduct and behavior which would keep the AIR member in good standing with his/her professional colleagues and give credibility to his/her work as a professional. Panel
3:30 – 5:00 p.m. *Claypoole* Susan Broyles IPEDS Project Director Roslyn Korb Director, Postsecondary Cooperative Program National Center for Education Statistics	**IPEDS Update: Looking to the Future** Any change to the Integrated Postsecondary Education Data System (IPEDS) conducted by the National Center for Education Statistics (NCES) has the potential to impact the work of institutional researchers in all types of institutions. Because of that potential, it is important to stay informed about the direction that IPEDS will be taking in the future. This panel will focus on several areas of interest to institutional researchers including changes to IPEDS for the 1998 – 2000 survey years and new methods for reporting these data electronically. Panelists will also discuss NCES' plans to redesign IPEDS including progress made in the implementation of the new racial/ethnic categories and the impact of new (or pending) legislation on IPEDS data collection activities. Panel

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Monday, November 16, 1998 continued

3:00 – 3:50 p.m. *Reynolds* David X. Cheng Director of Institutional Research Sheying Chen Department of Psychology and Sociology College of Staten Island, City University of New York Moderator: Reneva Sweet	**Factors Affecting Grading Practice** This study addressed a practical concern of grade inflation and a theoretical interest in the potential factors affecting grading practice. Empirical data from the student information system at the College of Staten Island, City University of New York were utilized. Implications for academic policy making and effective intervention are discussed, and important measurement and analysis issues in grading research are also indicated. Paper
3:00 – 3:50 p.m. *Flower* Michael J. Keller Director of Policy Analysis and Research Monica E. Randall Policy Analysis and Research Specialist Maryland Higher Education Commission Moderator: Judith Jaffe	**The Relationship between Student Success in College and Assessment for Remedial Assistance** This paper examines the success rates of students at Maryland community colleges and public four-year campuses based on the amount of remedial assistance for which they were assessed in math, English and reading: none, one area, two areas, or all three areas. Breakdowns by gender and race are included. Paper

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

3:00 – 3:50 p.m. *Cook* Marian Pagano Associate Provost Columbia University **1994-95 NEAIR President** Moderator: Jennifer McKnight	**Images of Colleges and Universities in Popular Cinema** The impact of the image of colleges and universities projected to the public in popular cinema is described and discussed while viewing clips from several influential and/or popular films that had a college or university as a central focus. The impact that such images have on the public's opinion of higher education will be discussed along with data that might support the power of these images. Paper
3:00 – 3:50 p.m. *Bromley* Kenneth E. Redd Senior Research Associate Sallie Mae, Inc. Travis Reindl Policy Analyst American Association of State Colleges and Universities Moderator: Marilyn Blaustein	**The Effects of Institution-funded Student Financial Aid on College Finances, Student Enrollments, & State Financial Aid Policies, FY90-96** Since 1990, institutional financial aid provided by public four-year colleges and universities has jumped by 62 percent, while aid awarded by private colleges rose by 61 percent. Much of this increase occurred at highly selective institutions. This study uses IPEDS data to examine trends in institutional aid at public and private institutions, compares these trends to changes in other education-related expenditures, and uses NPSAS and FISAP data to examine changes in the income levels of students who attend these colleges. The study also looks at how changes in institutional aid may have been influenced by changes in state financial aid policies. Paper

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Monday, November 16, 1998 continued	
4:00 – 4:50 p.m. *Reynolds* Karen DeMonte Research Analyst Karen Bauer Assistant Director, Institutional Research and Planning **NEAIR President-elect** University of Delaware Moderator: Tracy Hunt-White	**Using Microsoft Access to Facilitate the Sampling and Distribution of an Alumni Survey** Microsoft Access was used in an alumni survey that required a specific matched sample of respondents. The presenters will discuss how Access was used to select the respondents, organize the dataset, and create labels for the initial and follow-up mailings. Workshare
4:00 – 4:50 a.m. *Flower* Robert K. Toutkoushian Executive Director, Office of Policy Analysis University System of New Hampshire Moderator: Dawn Terkla	**Why Students Send Their Test Scores to a College: A Case Study** In this study, I show how data from the College Board can be used to examine whether a student decides to have his or her SAT scores sent to a particular college. The study relies on both time-series and cross-section data, and special emphasis is given to the importance of findings for institutional research. Paper
4:00 – 4:50 p.m. *Cook* Catherine E. Watt Director of Institutional Research Jennifer L. Vest Assistant to the Dean for Retention Research Washington College Moderator: Mike Middaugh	**Evaluating Faculty Work: Merit Pay and Post-tenure Review at a Liberal Arts College** Effective and reliable evaluation of faculty work at a liberal arts college is a complicated process that attempts to quantify numerous activities. Research endeavors are the easiest to measure, but teaching and service are also important. This workshare presents an evaluation schema that could be used across disciplines and throughout a professor's career. Workshare

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued	
4:00 – 4:50 p.m. *Bromley* Marcia M. Lee Director, Institutional Research and Planning Westchester Community College Moderator: Jennifer Brown	**An Environmental Scanning Formula for Community Colleges** Most community colleges have a mission substantially more focused than four-year institutions, specifically to serve the local community in providing postsecondary education and workforce training. To do this, a periodic environmental scan is essential, yet many institutional research offices shy away from incorporating this into their routines. This paper proposes a five-part formula for environmental scans, including population trends, economic trends, job market growth trends, high school graduation trends, and commutation trends, designed to make the project easier, focused, and usable the next time around. Paper
5:00 – 6:00 p.m. *Ballroom B, C, & D* David Hollowell Executive Vice President University of Delaware	**Providing the Technology Infrastructure to Support Innovation in Teaching and Learning** **General Session**

NEAIR 25th Anniversary Conference

Monday, November 16, 1998 continued

6:00 – 6:50 p.m.	**Special Interest Groups**
Reynolds Jason P. Casey Director, Research Center Penny Blackwood Research Associate Association of Independent Colleges and Universities of Pennsylvania	**Association of Independent Colleges and Universities of Pennsylvania**
Flower Jane Hammond Tompkins-Cortland Comm. Coll.	**SUNY AIRPO**
Cook Eleanor Swanson Director, IR Monmouth University	**New Jersey Association for Institutional Research**
Bromley Corby Coperthwaite Director, IR Manchester Comm-Tech College	**Connecticut Association for Institutional Research**
Claypoole Linda Winkler Director of IR and Planning Mount Saint Mary's College	**Catholic Colleges and Universities**

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Tuesday, November 17, 1998

7:30 – 8:50 a.m. *Ballroom B, C, & D*	**Continental Breakfast and Table Topics**
Emily Thomas Paula Pelletier SUNY Stony Brook	**PeopleSoft and Institutional Research** A number of schools are implementing PeopleSoft systems to manage student, financial and personnel data. This table session will give their IR professionals the opportunity to meet with each other, share information, and discuss issues on which they are working or about which they are concerned.
Peggye Cohen George Washington University	**Banner and Institutional Research** This session is offered to meet the needs of institutional researchers who use Banner. We will discuss topics such as reporting from Banner, implementing and upgrading Banner, the upcoming SCT Summit conference, etc. Hopefully, we can share experiences—both positive and negative—and learn from one another. Both new and experienced Banner users are welcome.
Sarah Parrott Dawn Geronimo Terkla Jennifer McKnight Tufts University	**Using New Scanning Technology with Principia Remark Software** Aimed at IR professionals who currently use Remark Office OMR, or those who are searching for a scanning system. This discussion focuses on how our office outgrew our desktop scanner and our trials and tribulations in choosing a new, faster document scanner that would work with Remark Office OMR.

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

7:30 – 8:50 a.m. *Ballroom B, C, & D*	**Continental Breakfast and Table Topics continued**
Donald R. Jansiewicz Carroll Community College	**In the Trenches: IR and Learning Outcomes** This table topic outlines a clinical approach that institutional researchers can use in developing and measuring learning outcomes. The political economy of academe is examined along with obstacles to faculty introspection. The presenter suggests how researchers can leverage their expertise to create a “culture of accountability” and identifies successful/unsuccessful strategies.
Jane Grosset Community College of Philadelphia	**A Description of the Process Used to Develop Performance Indicators for Assessing Institutional Progress in Achieving Technology-Related Goals** The topic for this table discussion is a description of the process that was used to develop indicators for use in evaluating institutional progress in achieving the goal of ensuring student and institutional success through the expansion of technology usage. This process included the following steps: conceptualization, measurement, data collection, and assessment.

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

7:30 – 8:50 a.m. *Ballroom B, C, & D*	**Continental Breakfast and Table Topics continued**
Dana A. Cantu Community College of Philadelphia	**Aligning Institutional Research with Campus Transformation** Offices of institutional research have become increasingly responsible for providing much of the information necessitated by campus transformation efforts occurring nationwide. Phrases like "Strategic Planning" and "Total Quality Management" are heard from campus to campus. Yet, what are campus transformation efforts designed to achieve, and what have they achieved thus far on our campuses? How can Institutional Research offices cope with the demands of future change? The aim of this table topic is to expand participants' understanding of campus transformation processes as well as provide them with a venue for the discussion of positive and negative changes, which have resulted from the process.
Reneva Sweet Edinboro University of Pennsylvania	**Racial Coding** A current, efficient, and accurate means of data collection and dissemination is inherent in our data integrity initiative. Edinboro University of Pennsylvania recognized the urgent need for implementation of a race/ethnicity policy. Our policy remains within the guidelines of the OMB directives, yet is tailored to fit Edinboro's unique needs. It is our intention to share this policy, along with all processes and procedures, in order to aid other's adaptation to the new federal standards.

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

7:30 – 8:50 a.m. *Ballroom B. C. & D*	**Continental Breakfast and Table Topics continued**
Bob Yanckello Central Connecticut State University Nancy Reiser University of Rhode Island	**Focus Group 1: The Newport Conference** A focus group to elicit information on the strengths and weaknesses of this year's conference led by the program chair of next year's conference. By invitation. **Focus Group 2: The Newport Conference** A focus group to elicit information on the strengths and weaknesses of this year's conference led by the local arrangements chair of next year's conference. By invitation.
8:00 – 8:50 a.m.	**Breakfast Workshares: In break-out rooms indicated**
8:00 – 8:50 a.m. *Reynolds* Joseph E. Revelt Director of Institutional Research Millersville University of Pennsylvania Moderator: Steve Thorpe	**Report Writers – A Technical Solution to Data Needs** Report writers – software packages used to query a database – have evolved significantly in recent years. Modern report writers can be installed on PC's, networks, etc. and provide numerous output options including spreadsheets, web pages, etc. This presentation will briefly demonstrate such a product and illustrate how Millersville University selected one. Workshare

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

8:00 – 8:50 a.m.	**Breakfast Workshares (continued): In break-out rooms indicated**
8:00 – 8:50 a.m. *Flower* Andrew S. LaManque Research Analyst, Office of the Vice President for Academic Affairs Eric Spear Data Systems Manager Office of Institutional Studies University of Maryland, College Park Moderator: Ray Perry	**Designing a Faculty Workload Data Warehouse Data Mart** This workshare will present information on the migration of faculty workload data from SAS data files to an oracle based data mart in the University of Maryland Data Warehouse. The presentation will cover both the technical aspects of data warehousing and BrioQuery'' dynamic querying technology, as well as lessons learned in transforming a workload system designed to produce a state report, into a useful tool for university administrators. Workshare
8:00 – 8:50 a.m. *Cook* Yuko Mulugetta Director of Research and Planning Analysis for Admissions and Financial Aid Cornell University Moderator: Dan McConochie	**Establishing a National Survey Scheme for Researching Distance Education** There is a growing awareness of the need to survey various aspects of distance education. Thus, a group of representatives of several national organizations have started organizing such efforts. A progress report on this endeavor will be presented along with available statistics and academic research on distance education, as well as major players and new technologies identified. Workshare

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NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

8:00 – 8:50 a.m.	**Breakfast Workshares (continued): In break-out rooms indicated**
8:00 – 8:50 p.m. *Bromley* Michael Duggan Director of Enrollment Research & Planning Tara Mahar Assistant Director of Enrollment Research and Planning Jennifer Hanley Ross Associate Director Creative Services/ Advertising Suffolk University Moderator: Helen Schneider	**What Do Prospective Graduate Students Want? Using Focus Groups to Find Out** In this session we will discuss the planning and implementation of a series of blind focus groups exploring what prospective graduate students look for in program advertisements. The discussion will also include the results of a survey that participants completed regarding how they make decisions on which program to pursue. Workshare
8:00 – 8:50 a.m. *Claypoole* Jason P. Casey Director of Research Penny Blackwood Research Associate Association of Independent Colleges and Universities of Pennsylvania Michael D. McGuire Director of Institutional Research Georgetown University **1993-94 NEAIR President** Moderator: Linda Winkler	**Using Graphics for Single- and Multi- Institutional Analyses in Institutional Research** Thorough treatment of data typically involves various stages of exploration, diagnosis, analysis, and presentation. Each of these activities is aided by the use of graphical tools. The presenters will demonstrate a number of graphical techniques in addressing problems in these areas. Graphs created in several packages will be demonstrated. Workshare

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

9:00 – 9:50 a.m. *Reynolds* Qing Lin Mack Associate in Institutional Research Jennifer Brown Executive Officer Academic Affairs and Research Connecticut State University System **1996-97 NEAIR President** Connecticut State University Moderator: Patty Murphy	**Financing Education, An Analysis From the Results of a Survey of Graduates** At the four universities of Connecticut State University, we graduate about 4,000 students a year with Bachelor's degrees. Since 1989, we have collected data on how our students finance their education at CSU. In our presentation, we will examine trends in student patterns of educational financing against a background of economic downturn and changes in financial aid policies. Paper
9:00 – 9:50 a.m. *Flower* Wayne Obetz Research Associate Office of Institutional Research Community College of Philadelphia Moderator: Cherry Danielson	**Using Cluster Analysis for Transcript Analysis of Course-taking Patterns** In order to improve the delivery of services to students, colleges must examine the curricular experiences of those students. Typically this would call for a transcript analysis, a costly and time-consuming process. This study makes use of cluster analysis to identify discrete groups of A.G.S. graduates form a community college. Paper

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

9:00 – 9:50 a.m. *Cook* Phyllis A. Fitzpatrick Director of Management Information Fairfield University Dawn Geronimo Terkla Director of Institutional Research Tufts University **1992-93 NEAIR President** Moderator: Denise Krallman	**The National Postsecondary Education Cooperative: Up Close and Personal** An opportunity to inform NEAIR members of the National Postsecondary Education Cooperative (NPEC): its origins, its progress since inception in 1994, its mission and its membership make-up. Workshare
9:00 – 9:50 a.m. *Bromley* Toby Milton Director of Institutional Research Essex Community College Moderator: Craig Clagett	**The Assumptions Underlying Concepts of Performance Budgeting** This presentation examines the concept of "performance budgeting", places it in the context of other budget concepts, describes types of performance budgeting, analyzes assumptions underlying performance budgeting, and notes relationships between performance budgeting and earlier budget reform concepts. Based on these examinations, it then questions the feasibility and desirability of governments and institutions implementing performance budgeting practices. Paper

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

9:00 – 9:50 a.m. *Claypoole*	**New Approaches to the Analysis of Academic Outcomes**
Karl Boughan Supervisor of Institutional Research Prince George's Community College **1997 Best Paper**	Using two advanced structural modeling methodologies – path analysis and cluster analysis – parallel models of the academic programs at Prince George's Community College were developed, supported by data tracking the Fall 1990 entering cohort over a period of six years. Path analysis revealed the centrality of student attitude factors (motivation, flexibility, academic gamesmanship) to study career success compared with the lesser impacts of social background, college preparedness, and various process variables. Cluster analysis identified several varieties of success-prone students, as well as three different student sub-bodies, each highly problematic for distinctive reasons.
Moderator: Anne Marie Delaney	Paper

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

10:00 – 10:50 a.m.
Reynolds

Weaving the Fabric of a Successful Transition: Collaborative Research Efforts between Community Colleges and Public Schools, a Maryland Model

Institutional research personnel and policy analysts will discuss the history of Maryland's Student Outcomes Assessment Report (SOAR), factors leading to collaborative community college-public school research, highlights of collaborative projects, and common problems, successes and findings from these projects. The impact of these projects on state and institutional policies will be highlighted.

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Anne Arundel Community College

Karl Boughan
Prince George's Community College

Gayle Fink
Anne Arundel Community College

Ruth Garies
Montgomery College

Yun Kim
Charles Community College

Dan McConochie
Howard Community College

Koosappa Rajasekhara
Dundalk Community College

Monica Randall
Maryland Higher Education Commission

Panel

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

10:00 – 10:50 a.m. *Flower* Sarah Parrott Research Analyst Jennifer McKnight Research Analyst Tufts University Moderator: Eleanor Swanson	**They'll Surf but they Won't Swim: Student Reluctance to Apply to College Online and Implications for Web-based Survey Research** Why are college-bound students happy to surf the Internet for college information but reluctant to apply to college online? Using a large, multi-institutional sample of entering freshmen, this study examines the reasons they give for not applying online, and uses the information to develop strategies for institutional researchers who plan to conduct Internet-based surveys. Paper
10:00 – 10:50 a.m. *Cook* Ellen Kanarek Vice President Applied Educational Research, Inc. **1995-96 NEAIR President** Moderator: Karen Bauer	**Trends in the Admitted Student Questionnaire and Admitted Student Questionnaire Plus** This workshare will describe trends in the College Board's Admitted Student Questionnaire and the Admitted Student Questionnaire Plus since the service was first offered in 1988. In addition to comparisons between early and recent participants as a group, the presentation will examine selected colleges that used the survey regularly during the period. Workshare
10:00 – 10:50 a.m. *Bromley* Cheryl Beil Director, Academic Planning and Assessment The George Washington University Moderator: Andrew LaManque	**Up to their Nose-rings in Credit Card Debt** How student-loan debt, student over-employment, and credit card abuse interact and impact the undergraduate experience and contribute to student attrition will be the focus of this presentation. Findings from a survey of 1,000 undergraduates exploring these issues will be presented and discussed. Paper

NEAIR 25th Anniversary Conference

Tuesday, November 17, 1998 continued

10:00 – 10:50 a.m. *Claypoole* Jishen Zhao Research and Planning Analyst Prince George's Community College Moderator: Craig Clagett	**Assessing Academic Outcomes of Under-prepared Community College Students: A Structural Equation Modeling Approach** This ongoing study was designed to assess the four-year academic outcomes of under-prepared students at Prince George's Community College. It updates the profile of these students, and identifies the factors affecting their academic progress by adopting a structural equation modeling approach. Paper
11:00 a.m. – noon *Ballroom B. C. & D* Robert Lay **1982-83 NEAIR President** Marian Pagano **1994-95 NEAIR President** Patrick Terenzini **1980-81 NEAIR President** Dawn Geronimo Terkla **1992-93 NEAIR President** Moderator: Michael Middaugh **1989-90 NEAIR President**	**Closing General Session: NEAIR Presidents' Panel** The Role of Institutional Research in Campus Transformation Bill Flynn started the conference describing the changes in mission, vision, and structure associated with campus transformations into learner-centered institutions. In this session, former presidents of NEAIR will be asked to discuss past college transformations and how they changed institutional research. They will then assess the state of transformation on their campus—are their institutions embracing, ignoring, or resisting current forces of change? Finally, the panelists will predict what this means for institutional research. What is the role of institutional research in campus transformation? How will such paradigmatic shifts and technological advances impact our profession? Panel
Noon – 4:00 p.m. *Reynolds*	**Steering Committee Luncheon Meeting**

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